PRICE 50 CENTS

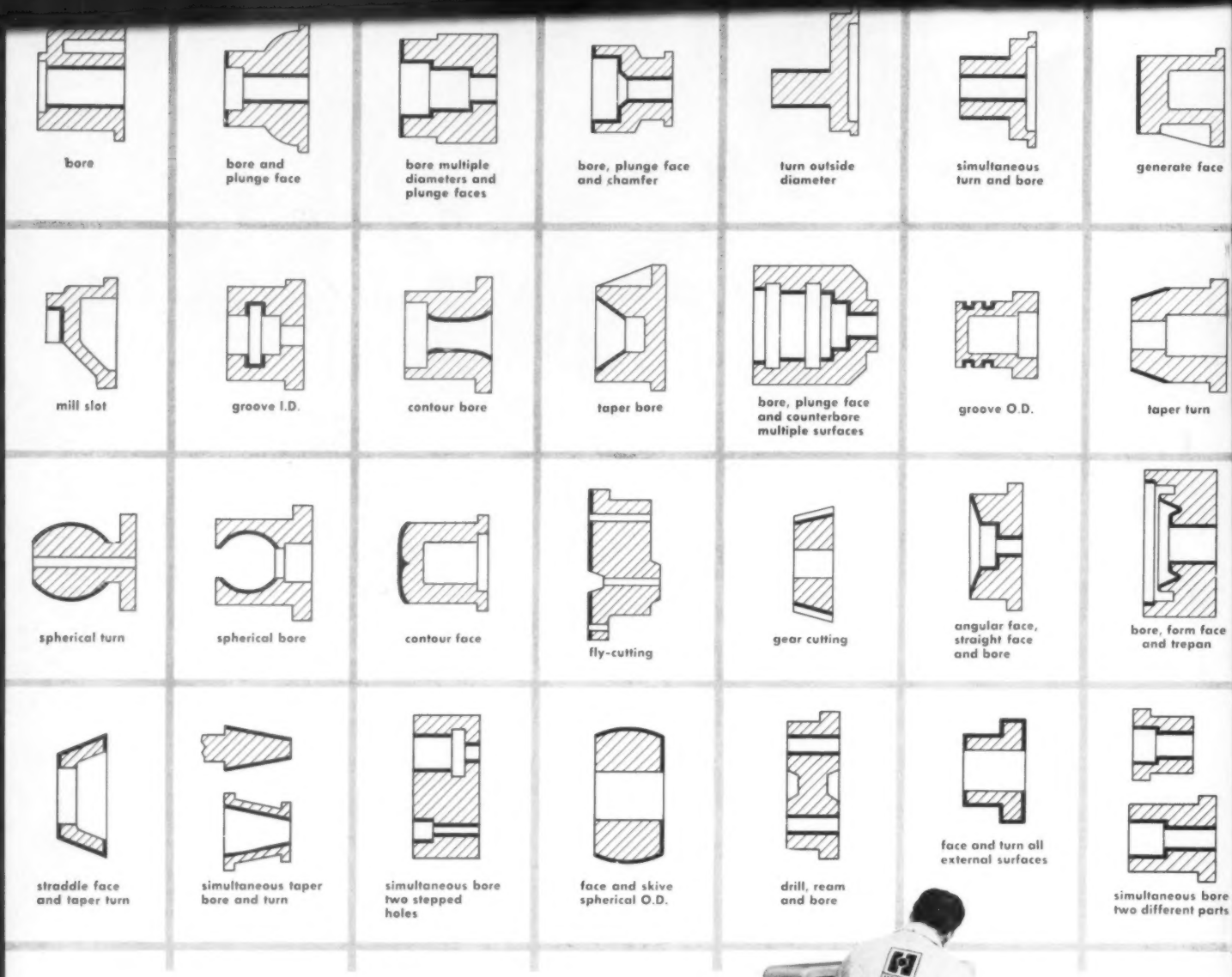
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

MAY 23, 1955

Gaging a jet nozzle assembly — see page 2

Ideas in Ford's New Tappet Line . . . Which Tracer Lathe When?



which of these operations can't be done on a Heald Bore-Matic?

With one exception, all of the operations shown here, plus many more, are routine for a Heald Bore-Matic — a *single-end* Heald Bore-Matic using a *single setting*, as a matter of fact!

What's more, practically any of these operations can be *combined* in a single, high speed automatic cycle — finishing a variety of different surfaces, either simultaneously or in sequence, at a single setting. This fact makes a Heald one of the most *versatile* and *productive* precision finishing machines ever developed. As you have probably guessed by now, the one job shown that a Bore-Matic can't do to advantage is gear cutting.

Whatever your borizing problem, you'll find that IT PAYS TO COME TO HEALD!

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NUMBER OF COPIES PRINTED THIS ISSUE 38,568

chips

INSPECTION DELUXE . . . Our cover photo shows (left) Maj Gen W O Senter, commander Okla City Air Materiel Area, USAF; and Col S A Dallas, USAF plant representative at Allison, discussing inspection of a chamber and nozzle assembly for a turbojet (left). The assembly is vertical on the rotary table of a 48-in. Rotab table, while a 36-in. unit at right supports a smaller assembly. Both are on an 8 x 10-ft granite surface plate. The inspector is using a special 50-in. Tumico height gage equipped with a Precisionaire head. It is set by the 36-in. Pla-Chek unit at right of the assembly, and is the prototype, flown in for this picture.

This cover, and our biographical sketch, serve to introduce the current 12-page Special Report describing Allison's inspection equipment for vendor parts for turbojet and turboprop engines. Here is a very unusual system, with highly flexible equipment, you'll want to know more about. All data published were checked and released by the Air Force and the Dept of Defense and appear exclusively here.

IRON POWDER . . . Sven I Hulthén, metallurgist of Hoganas-Billesholms Aktiebolag, in Sweden, presented a really authoritative paper at the annual meeting of the Metal Powder Assn in Philadelphia May 10-12. It covers iron-powder metallurgy in Europe like the proverbial tent. A long-time friend of *AM*, he directed an advance copy to us. So good was it that we've rushed a 12-page distillation of it into this issue as your second Special Report. Here is authoritative information.

DOCTOR'S DOCTOR . . . A new "shear-angle" clamp-type holder on 20 planers at Giddings & Lewis saves $20,000 a year and cuts floor-to-floor time 14%. Gang holders save $4000 a year, cut time 13.8% on production planing of bedways. Here is the doctor taking his own medicine with a vengeance. We tell all in a 3-man lead article.

FORD REVEALS . . . Ford is at it again—this time on a tappet line. George De Groat, our Detroit sleuth, comes up with the latest in small-parts automation. This 4-page article required special permission to get, but will, we think, be worth the effort in ideas for you.

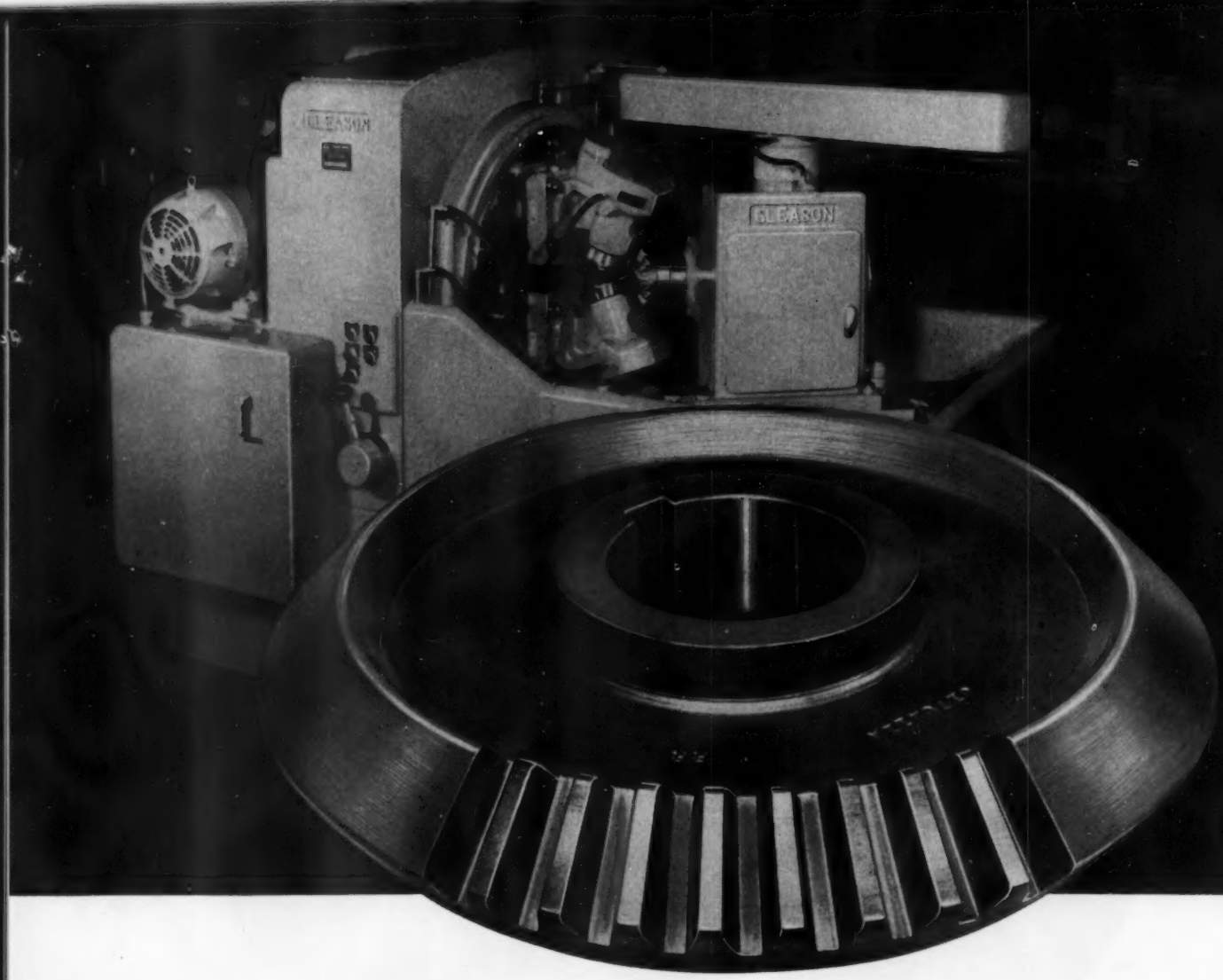
TANKS AGAIN . . . Fairbanks-Morse is making galvanized tanks on a mechanized line at its Three Rivers Works. We describe the setup, combining manual and automatic welding in a conveyorized plant.

TRACER LATHES . . . C M Newbury, chief industrial engineer of De-Laval Separator, Poughkeepsie, NY, uses several kinds of tracer lathes. Here, in several case studies, he compares best points of each type, gives typical feeds and speeds . . . Another tooling article is a single page showing solution of a triple grooving job in 100 castings.

COMING . . . June 6 *AM* will include several rather unusual elements. First is a 16-page Special Report on the GE gas-turbine plant—its tooling tricks and methods on stainless and other materials. There's also a description of an 8-year apprenticeship for die-sinkers. The front cover pictures one brand-new machine tool, the lead article another—both pushbutton types and one resetting its own tool, even on several spindles. Other articles cover job-shop production control, catalytic mufflers, and several tooling tricks. Watch for this one.

JET CHECKERS . . . William L Jacoby, Jr, (left) studied mechanical engineering at the Univ of Colorado, had graduate work at Illinois Tech. After a fling at managing outdoor spectacular advertising displays, he was a gage control supervisor at Chrysler and then planning mgr at Solar Aircraft. At GM he has been supt of gage control first for the Electro-Motive Div, and now for Allison. A past pres of Midwest Gage Assn, he wrote our current Special Report with . . .

John C Terry, Jr, a mechanical engineer in aeronautics from the Univ of California, following study at City College of Los Angeles. He worked in quality control successively for Twigg Industries, the Air Force, Stewart-Warner, Armstrong, and Convair, is now gage engineering supervisor for the Allison Div of GM.



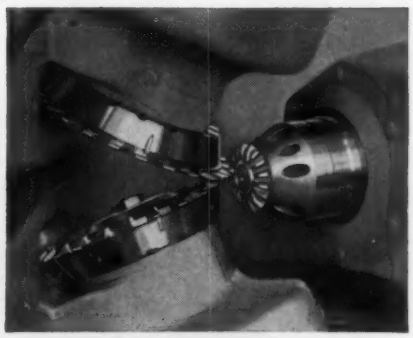
A complete gear for a fifth of a gear!

It all depends on the gear, of course. But, by the time an earlier model generator has cut one-fifth of a gear, the new No. 104 Straight Bevel Coniflex* Generator has *completed* a similar gear!

You can increase your production by as much as 400% with this new Gleason machine. You can get these results because this generator has two interlocking disc-type cutters with twenty-four blades each. These cutters complete a gear in *one rapid operation!*

But that is not all. The No. 104 is easy to set up—it has a wide range of capacity—it is excellent for small quantities or volume production. And, a new generating method insures high efficiency, fine finish, and maximum cutter life.

Write us and we will be pleased to send you a bulletin and further information on the new No. 104 Straight Bevel Coniflex Generator.



The No. 104 Straight Bevel Coniflex Generator completes gears up to 8½" diameter and 1⅜" face width, and from 20 to 3 DP.

*Coniflex® straight bevel gears with localized tooth bearing.

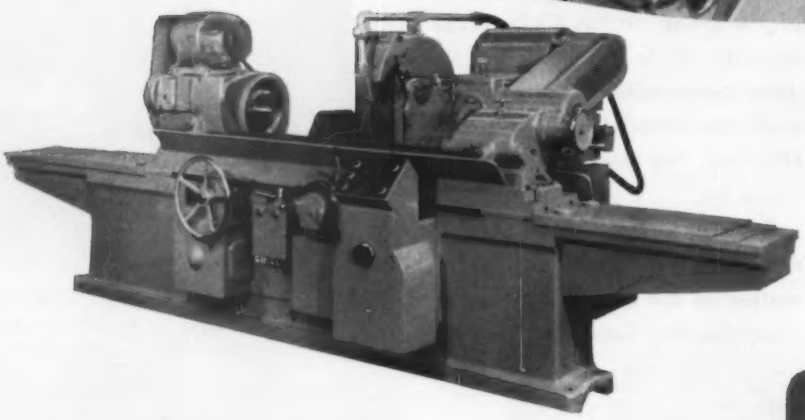
GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

Cincinnati Filmatic 18″

Adds the final touch of quality to



CINCINNATI FILMATIC 18″ Plain Grinding Machine.

HardClad* radial drill columns are ground to a high degree of accuracy and finish on this CINCINNATI FILMATIC 18″ x 72″ Plain Grinding Machine.

FILMATIC

CINCIN

Plain Grinder

*HardClad** columns

Assembling a radial drilling machine, in the plant of the Cincinnati Lathe and Tool Co.

Accuracy begets accuracy. It's especially true for radial drill columns, where high-quality finish and accurate, straight sizing are basic considerations to high-quality performance. HardClad* radial drill columns, a new non-scoring development by Cincinnati Lathe and Tool Co., are ground at low cost and to the highest standards of quality on the CINCINNATI FILMATIC 18" Plain Grinder illustrated here. These machines have many advantages for quickly grinding large work to the highest quality desired:

FILMATIC grinding wheel spindle bearings . . . outlast the machine; never require adjustment

Automatic wheel balancing . . . in seconds; while the machine is running

Automatic lubrication

Electronically controlled table traverse speeds

Many additional features of high-quality, low-cost performance. Write for more information.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

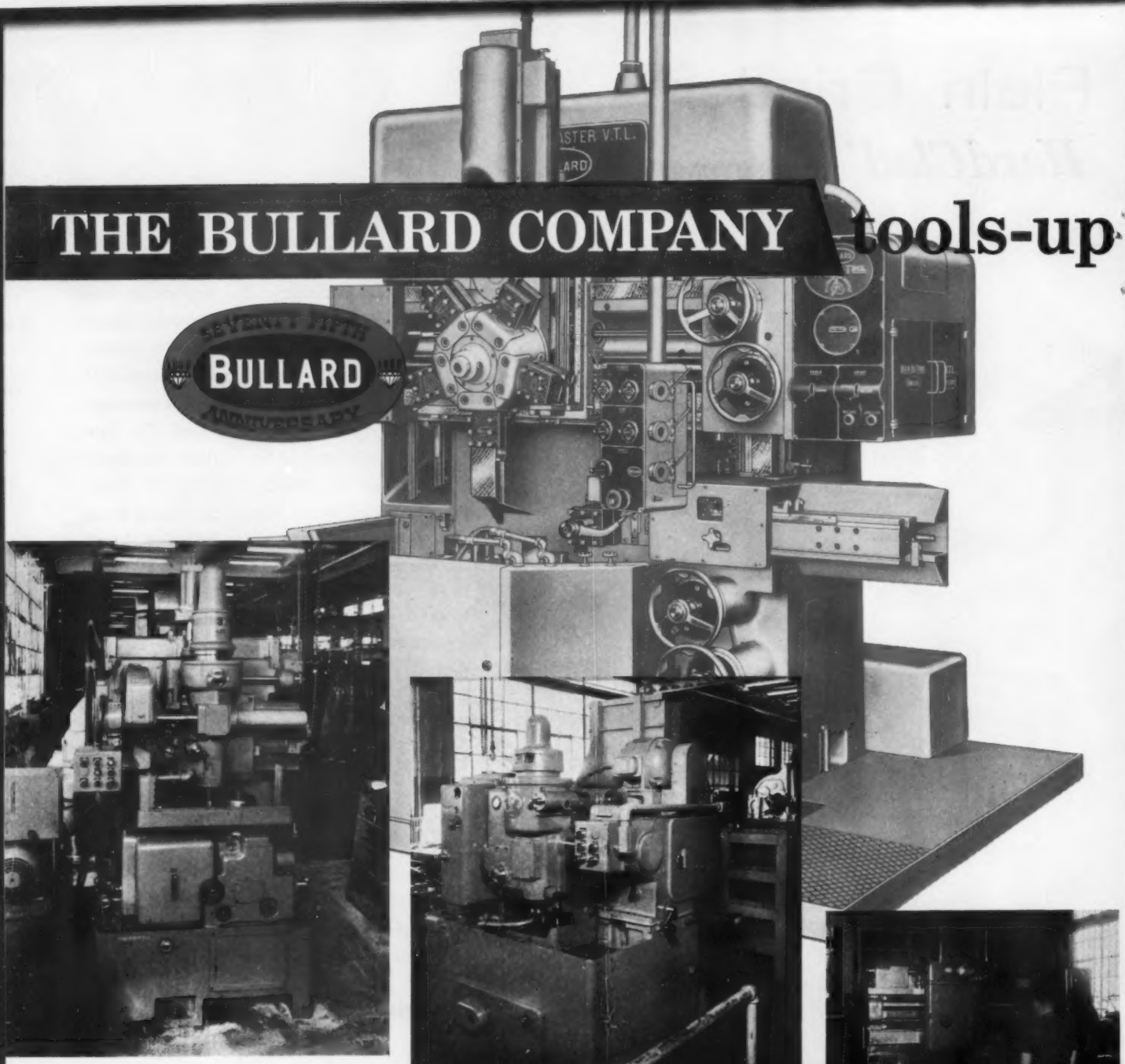
MACHINE TOOL SHOW INTERNATIONAL AMPHITHEATRE CHICAGO, ILL. SEPT. 8-17, 1952 — BOOTH 1205

*Note: HardClad is the trade name for the Cincinnati Lathe and Tool Co.'s flame hardened radial drill column.

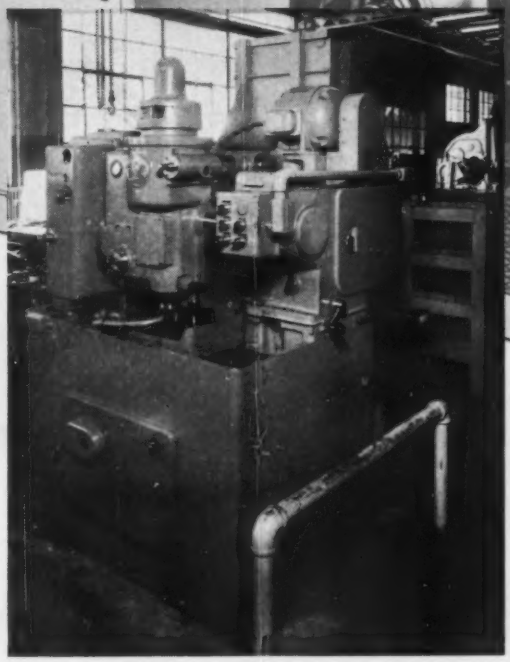
NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

THE BULLARD COMPANY tools-up



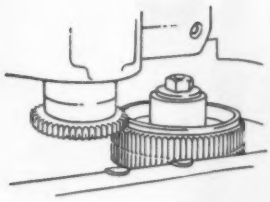
New HEAVY DUTY Fellows No. 12
Gear Shaper for internal or external gears up to 12" p.d. x 4" face.
44 to 550 strokes per minute.



New HIGH-SPEED Fellows No. 4GS
Gear Shaper for internal or external gears up to 6" p.d. x 2" face.
98 to 635 strokes per minute.

THE *Fellows*

with FELLOWS new "heavyweights"

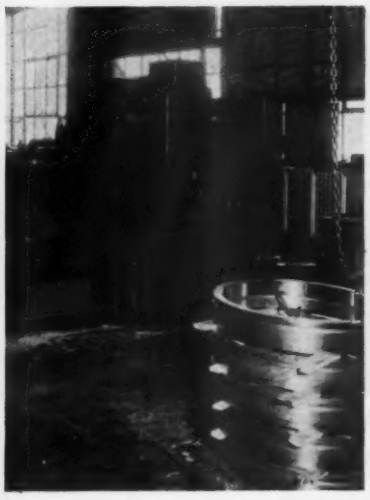


When Bullard needed more spur and helical gear cutting capacity at their big Bridgeport plant, they looked to Fellows' NEW HEAVIER DUTY MODELS.

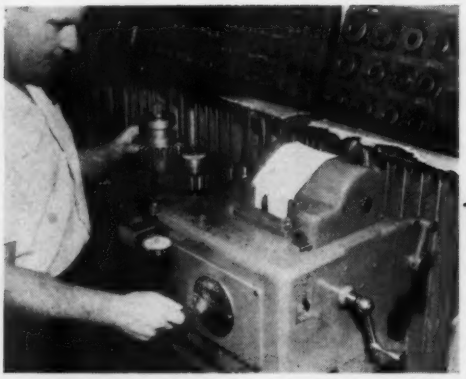
A NEW NO. 4GS and a NEW NO. 12 have been added to Bullard's two 36-Types—giving them maximum output capacity per unit of floor space—and size capacities for all the spurs and helicals in their modern Mult-Au-Matics, Horizontal Boring Machines, Cut Master and Man-Au-Trol Vertical Turret Lathes.

All three types of Gear Shapers in this battery have a wider range of speeds and feeds than previous models. They hold to closer tolerances while taking heavier cuts—and consequently produce more gears at a lower cost.

These new-model Gear Shapers have a cost cutting potential for any shop involved in heavy production schedules. The nearest Fellows Branch Office will be glad to estimate the possible savings on your gears—and present the Fellows Plan to those who may wish to consider term payments.



←**ALL-PURPOSE Fellows 36-Type** Gear Shapers for internal or external gears up to 36" p.d. x 6" face. 18 to 300 strokes per minute.



←Bullard Company also relies on Fellows "Red Liners", Lead Measuring and Involute Inspection Instruments for CHART-RECORDED PROOF of gear accuracy to keep costs and quality under constant control.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
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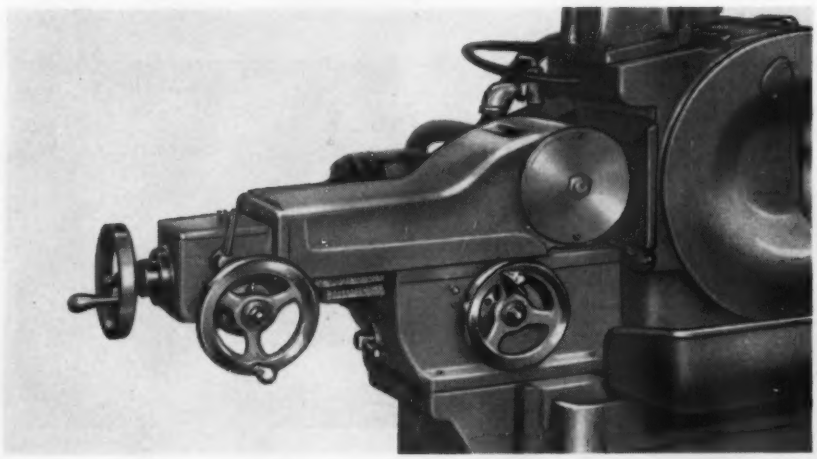
DIVERSIMATIC®
CENTERLESS GRINDER

Actually three machines in one. (1) The revolutionary Diversimatic is a standard centerless grinder for thru-feed work . . . (2) a standard grinder for in-feed jobs . . . (3) equipped with the Crush Dressing Attachment, it can grind complicated forms which can be ground no other way. The Diversimatic finish grinds small parts from solid . . . or finish grinds rough-turned parts. It grinds faster, holds closer tolerances, resulting in lower cost per piece.

The Diversimatic is an ideal machine for grinding a great variety of small parts made of metal, plastic, glass, etc. Especially suited for grinding parts used in business and office machines, sewing machines, electrical appliances, aircraft, automobiles, munitions, and similar work. Call, write or wire for full facts, today. See for yourself how this versatile grinder can cut your costs.

EXCLUSIVE CRUSH-DRESSING ATTACHMENT INCREASES SCOPE OF GRINDING OPERATIONS



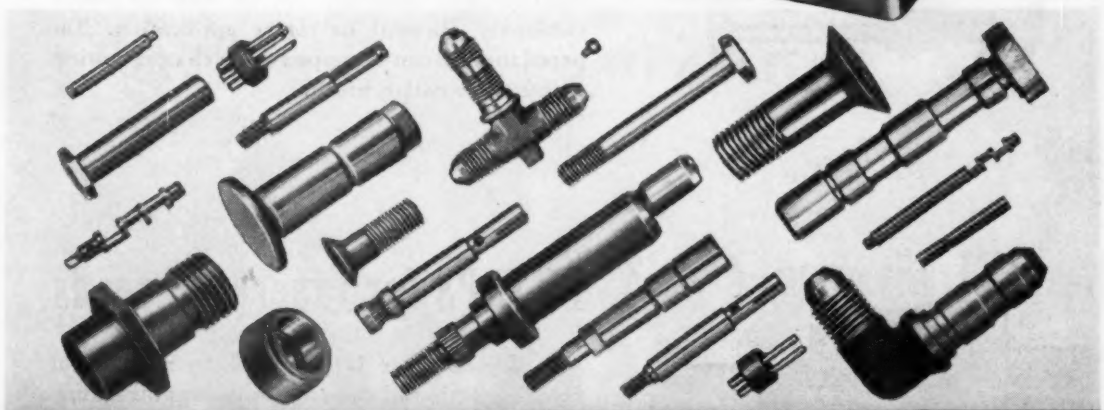
It crushes the wheel to the desired contour, and holds the form, allowing hundreds of pieces to be ground between wheel dressings, imparting the exact profile to the work.

VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Grinding of Small Parts...

Work Size: 0-1½" Diam.
Grinding Wheel: 14" O.D. x 4" wide
Regulating Wheel: 8" O.D. x 4" wide
Automatic cycle optional



GRIND PARTS LIKE THESE FASTER, MORE ECONOMICALLY . . .

Don't wait . . . for extra profits install a Van Norman Machine now!
They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

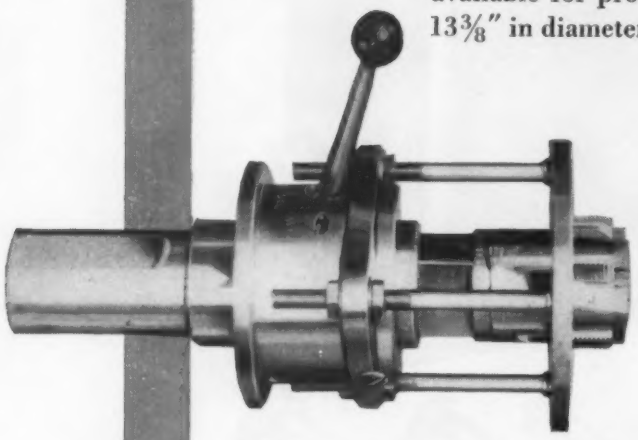
Lease and Conditional Sales Contracts not available to Export.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

LANDIS Collapsible Taps

Sensitive Collapsing Action

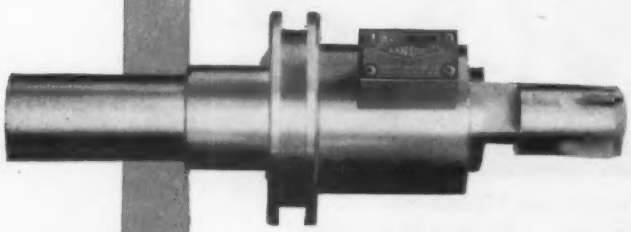
The design of LANDIS Collapsible Taps reduces tool wear, "torn" threads and tapping time by permitting direct removal from the workpiece without reversing or "backing out". The sensitivity of this "collapsing action", which automatically withdraws the chasers from the completed thread, assures uniform thread lengths and threading to a shoulder with safety. Various sizes of LANDIS Taps are available for producing straight or tapered threads from 1¼" to 13⅜" in diameter.



Stationary Tap

ALT TAPS for straight threads

These taps feature a rugged construction and design simplicity which enable maximum chaser rigidity. The same tap may be used for either stationary (shown) or rotary application. Tapered threads can be tapped using chasers cutting across their entire width.



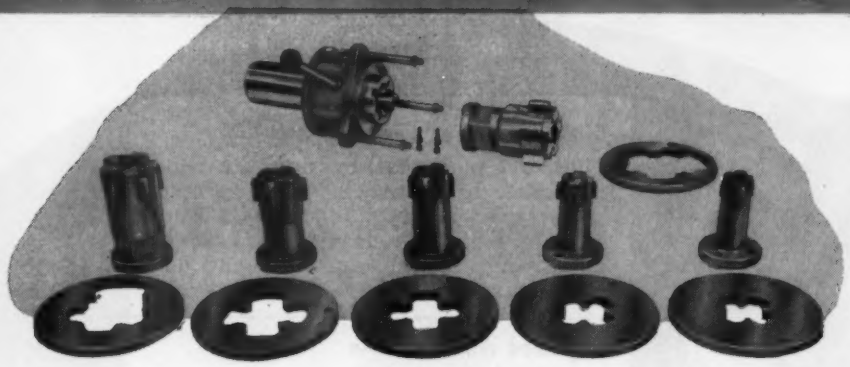
The Rotary Tap

LL TAPS for tapered threads

The thread taper is produced by mechanical receding action of the chasers during threading. This action reduces cutting strains by restricting cutting action to the chaser throat or chamfer section. As little or no "cold working" can result, LL Taps are ideally suited for tapping tapered threads in stainless steel. These taps will also produce straight threads, and are available for either stationary or rotary applications.

Sensitive Collapsing Action

Straight or Tapered Threads Rotary or Stationary Use

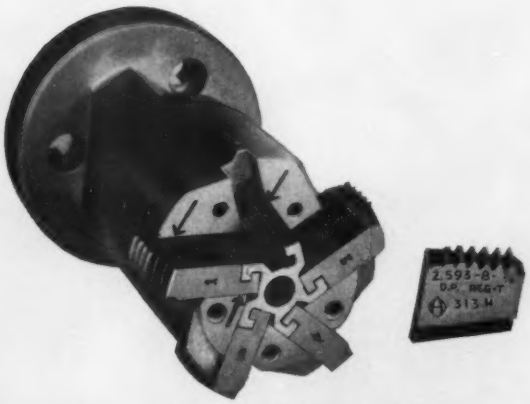


Wide Range Coverage

Detachable heads are a feature of all LANDIS Collapsible taps. This design allows tapping a wide range of thread diameters with minimum tooling—for example, the 3ALT body using 6 different heads will tap all diameters from 1¼" to 3¼". Each tap head itself has a wide threading range—the 1½" head will thread from 1⅜" to 1⅝", the 2" from 1⅞" to 2-5/16", the 3" from 2¾" to 3¼".

Maximum Rigidity

The basic design of all LANDIS Tap Heads assures maximum bearing support between the chaser, plunger and tap head body. In the cross-section illustration, note the heavy metal sections which provide rigidity to the chasers and plunger, particularly at the points where cutting strains are transmitted.



Size Adjustment Ease

All LANDIS Taps are designed so that they may be quickly adjusted approximately 1/32" over or under the nominal chaser size. The ratchet-type size-adjusting screw is conveniently located in the front of the tap. The movement of one ratchet tooth provides a self-locking diametrical adjustment of .001".

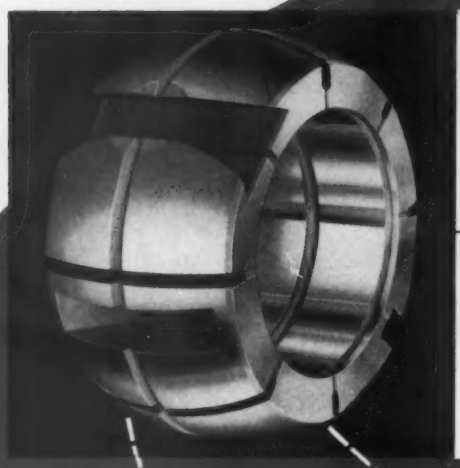
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

430-C THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

Straight or Tapered Threads Rotary or Stationary Use

Multi-wheel spindle



Rigidized Microsphere Bearings

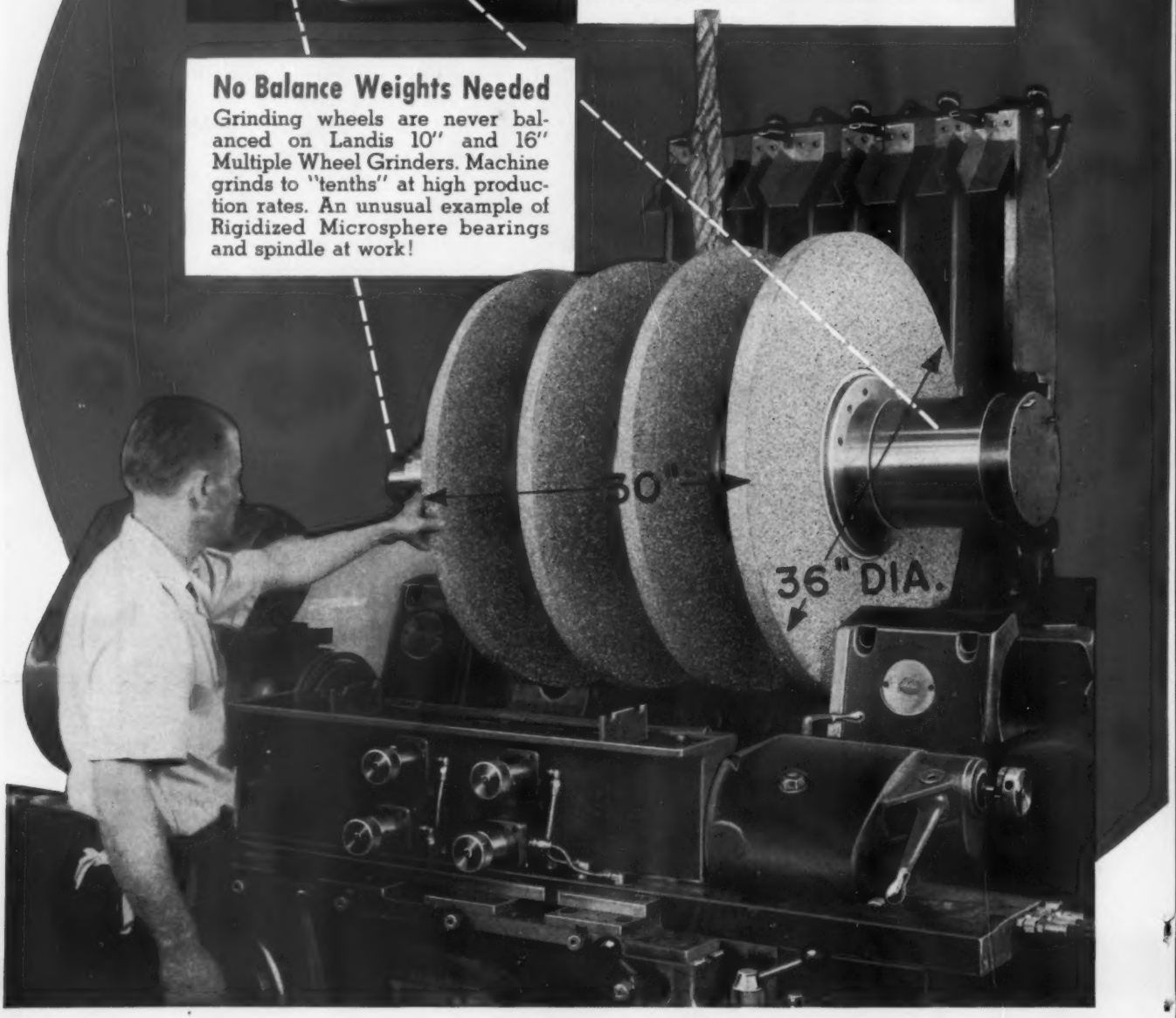
These one piece steel bearings are babbitt lined. The spherical shape permits perfect alignment of the spindle and bearing. Extremely close running clearance results in quick sparkout and accurate response to wheel feed.

Rigidized Wheel Spindle

Spindle diameter is increased between the Microsphere bearings on Landis grinders. This extra stiff spindle, coupled with the Microsphere bearings is the most rigid wheel unit available. Pays off in steady production and accurate work.

No Balance Weights Needed

Grinding wheels are never balanced on Landis 10" and 16" Multiple Wheel Grinders. Machine grinds to "tenths" at high production rates. An unusual example of Rigidized Microsphere bearings and spindle at work!



grinds to tenths

Rigidized Microsphere bearings and spindle solve unusual grinding problem

Grinds 5 diameters of 80 shafts per hour to .0005" tolerance. Stock removal is .015" from each diameter. Machine is Landis 10" x 30" Type H-IW Multiple Wheel Grinder.

LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

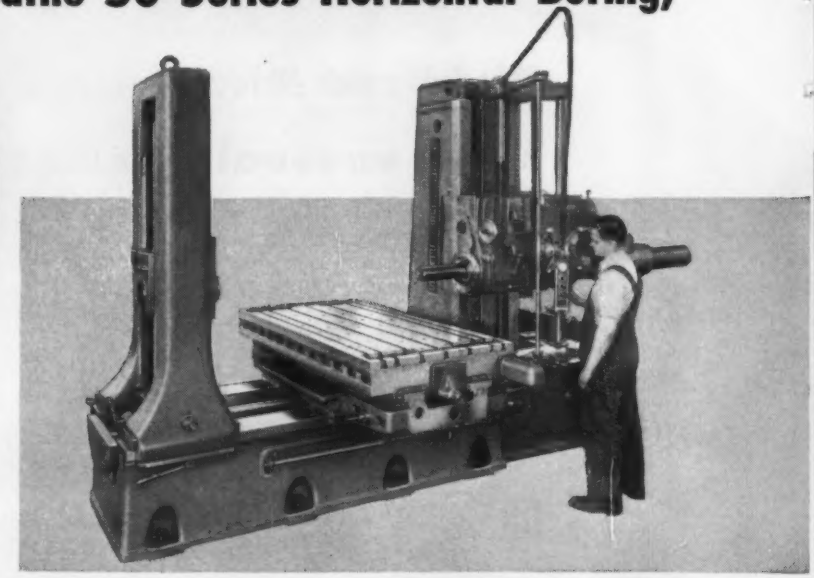
LANDIS

precision grinders

More optional arrangements give

with G & L versatile 30 Series Horizontal Boring,

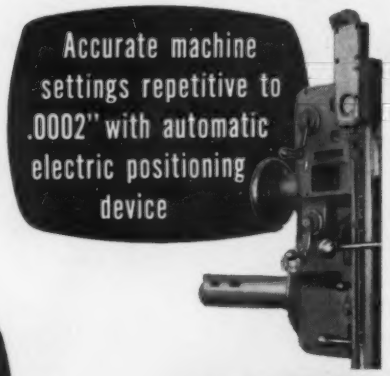
For accommodating large, heavy workpieces, various sizes of machine tables are available. Tables are rigidly supported on extended saddles (110″ to 170″) with saddle supports. This method of supporting the table provides extra rigidity . . . takes the guess work out of precision machining. What's more, it permits operator to move around the machine and the work without impeding his movements.



Model 340-T is equipped with 4-inch spindle and powered by 20 hp motor. Heavy-duty bearing design permits high speed range of 10 to 1300 rpm with 45 speed changes.

Bed Lengths — 72″ to 120″; Table Sizes — from 36″ to 60″ widths up to 132″ long with several intermediate sizes, and with 60″ to 120″ cross travel with saddle supports; Column Heights — 36″ to 60″. Also a full line of attachments and accessories are available for capacities over and above the usual run of the work.

Giddings & Lewis' versatile built-in power rotary tables eliminate locating and resetting of unusual workpieces which consume the greater portion of floor-to-floor time. They're available with ½ degree graduation and 90 degree adjustable cam type index stops. Eighteen power feeds may be engaged. Table can be rotated for accurate indexing to .001″ at any angle.



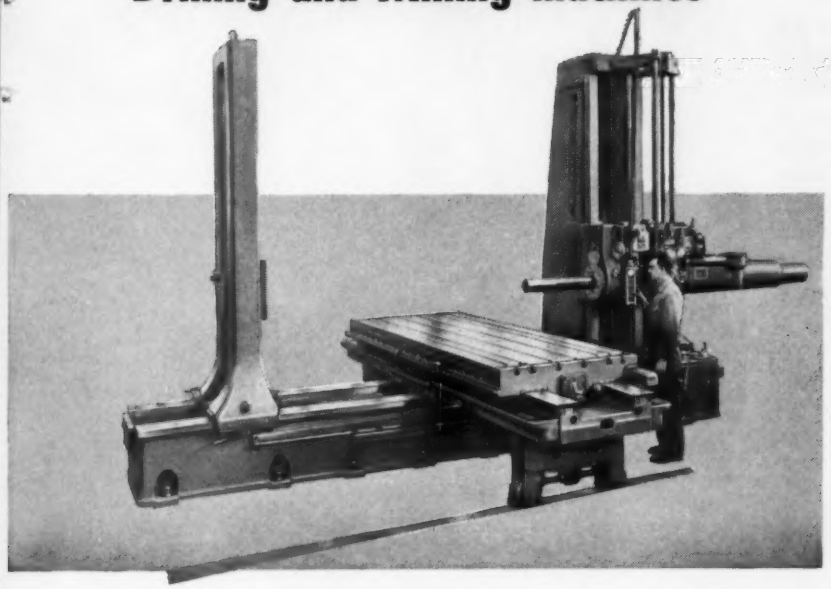
Electrically operated positioning device for both headstock and table travel is available on all G&L table machines with a 3, 4, or 5-inch diameter spindle. With it you eliminate time-consuming fine hand adjustments, work layout and inaccurate settings. It makes possible positive machine settings for precision boring operations repetitive to .0002″, each mechanically controlled to pre-determined setting. It accurately selects, maintains and controls distances between machined holes.

One of the important features of G&L machines is the built-in precision thread lead device. With it you can cut precision threads to any standard prescribed form, pitch and depth. A precision lead screw, attached to the ram, operates through pick-off gears which are available in various sizes.

Forms requiring intricate contouring and profiling, both internal and external, are machined rapidly and to close accuracy with Giddings & Lewis electronic Dupli-Tracer. The unit operates on a *selective dual system* — providing simultaneous control of the saddle and headstock, or saddle and table for contour milling work — or alternately the table and headstock may be automatically controlled to give 360 degree profiling. Dupli-Tracer is available for table and floor type machines.

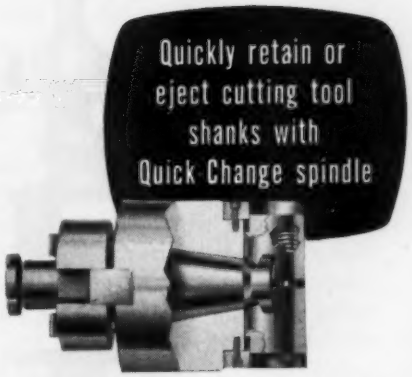
you *More Profit Opportunities*

Drilling and Milling machines



Model 350-T is the same basic design as the 340-T except that it's a proportionately heavier machine. It's equipped with a 5-inch spindle and powered by a 25 hp, 1800 rpm motor. Bearing design permits high speed operation and a speed range of 7.5 to 975 rpm with 45 speed changes.

Bed Lengths — 96″ to 144″; Table Sizes — from 48″ to 60″ widths up to 132″ long with several intermediate sizes, and with 60″ to 120″ cross travel and saddle supports; Column Heights — 48″ to 72″. Additional equipment, attachments and accessories are also available to increase working capacity.



New machine accuracy is always maintained with a G&L Quick Change spindle. You eliminate hammering to free shanks of cutting tools and prevent marring, distortion and expansion to spindle. It's optional at no extra cost instead of the Morse Taper spindle. When ordering specify Quick Change spindle.

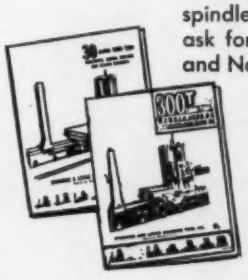
Precision table cross slots, machined at the factory, are recommended for greater rigidity and clamping of large workpieces. Cross slots assure positive alignment for locating jigs and various types of fixtures.

Giddings & Lewis Horizontal Boring, Drilling and Milling machines, table and floor types, give you a wider range of working capacities. They assure you greater profits than any other machine tools of their type and size. When you stop to consider the variety of operations possible, you'll understand why these machines are the most versatile and your best buy.

Models 340-T and 350-T, illustrated here, can be equipped with an extremely wide line of optional equipment and accessories, providing unlimited machining opportunities. For example, you can get power-driven rotary tables, extended saddles, precision thread lead unit, automatic electric positioning device, electronic Dupli-Tracer control head, Quick Change spindle, etc. With them, you're able to perform more machining operations and do them in less time... obtain better finishes... hold close tolerances and reduce setup time to a minimum.

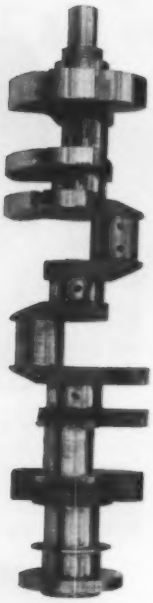
Compare these G&L's, and you won't buy any other machine. For complete specifications, see our nearest representative, or write direct.

Write for Literature . . .
For complete specifications on Giddings & Lewis 3, 4 and 5″ spindle table type machines, ask for catalog No. 30-T and No. 300-T.



GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.



what can you do when you face

When competitive pricing forces you to cut costs and replace money-losing machinery, the actual replacement cost may be greater than the depreciation reserve. Worse still, "reserves" may be on paper instead of in the bank, and the old machines may not make the down payment.

Don't wait for this kind of sudden obsolescence to hit.

Invest now in fast-earning, high yield Avey drilling machines, which sometimes pay for themselves in 9 months, generally less than 18 months—and then help build reserves for other needed equipment.

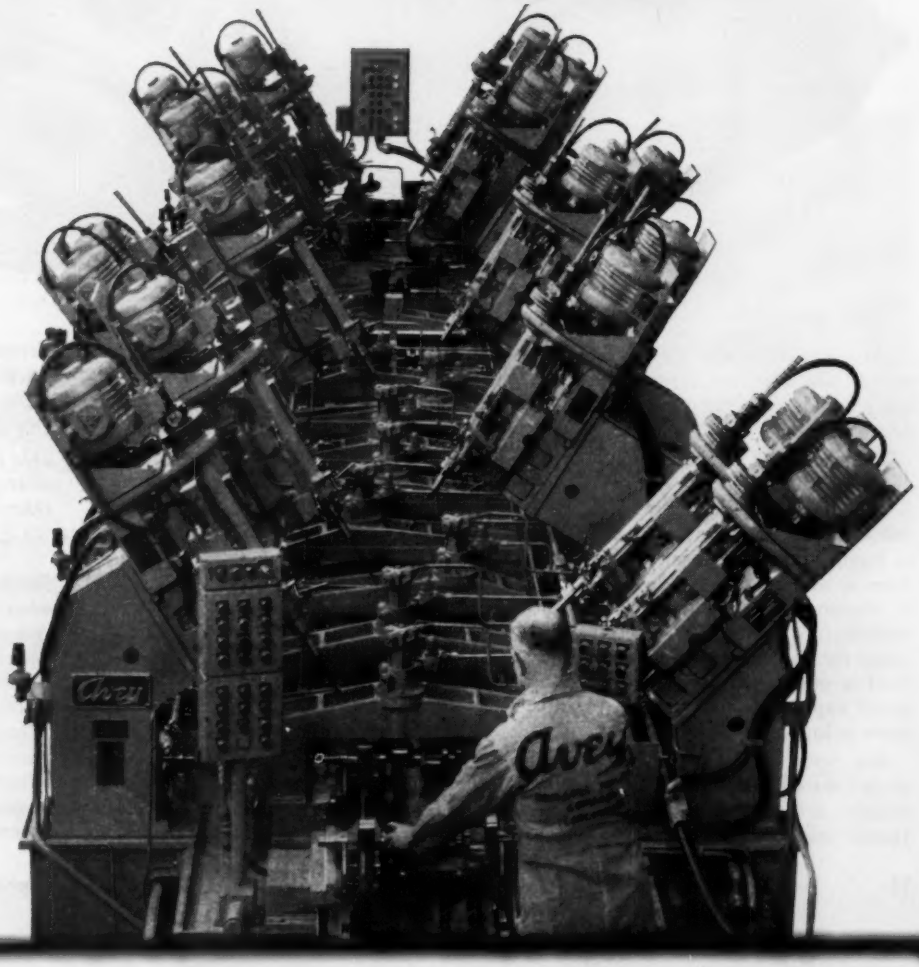
Avey machines earn their heads off because they make such surprising cuts in unit costs. Investment per sq. ft. of floor space is unusually modest. Then, when the order is done, you can generally re-engineer the Avey unit heads for another job at moderate cost, and start another profitable chapter in the history of your company. Send us a part print: ask for an Avey *profit prediction.*

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

sudden obsolescence?

Avey



Why you get top savings with

The "CROWN JEWELS"

No one disputes the fact that diamond wheels save time and money in carbide tool grinding. The big question is: *which* diamond wheels save the *most?*

There's a very logical answer. Buying diamond wheels calls for the same trust in the supplier — in his reputation for full value and expert craftsmanship — as buying diamond jewelry. And right there is where Norton's long leadership in diamond wheel development and manufacture is the best possible safeguard for your investment. In fact, only Norton offers you such long diamond wheel experience to help you produce more at lower cost.

For your further guidance, check these reasons why Norton diamond wheels are the recognized "Crown Jewels" of the entire field:

Norton was first to introduce the three major diamond wheel bond types — resinoid, metal and vitrified — and has always pioneered in their advancement.

The sizing, grading and laboratory checking of diamonds used in Norton diamond wheels is done in Norton's own plant — never anywhere else.

Norton duplicates specifications for each wheel type and size with utmost accuracy for uniform top performance.

The line of Norton diamond wheels is complete, with sizes and types covering not only every carbide grinding application but every other field — stone, glass, ceramics, electronics, etc. — where diamond wheels are used.

Norton diamond wheels for every need are quickly available from full stocks in Worcester, five strategically located warehouses and Distributor's stocks.

See your Norton distributor

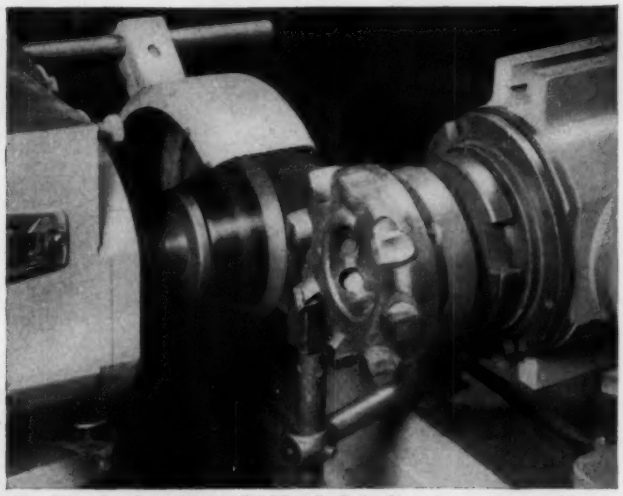
for further facts on Norton diamond wheel performance and applications. Ask him for the 142-page illustrated booklet, *Grinding Carbide Tools,* and the complete net priced Diamond Wheel Catalog. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Mass.

Norton Diamond Wheels...

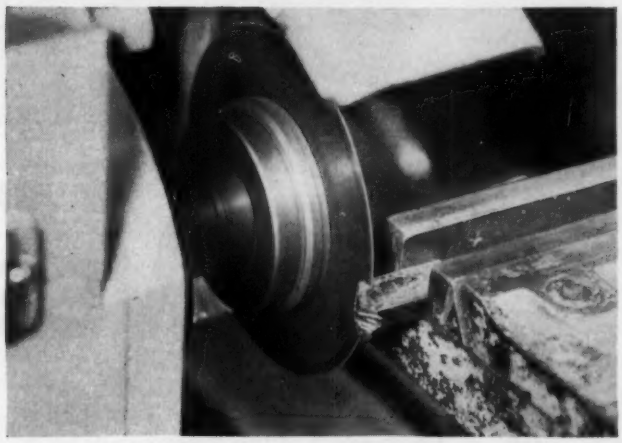
for carbide grinding

For Top Savings In Production Grinding of single point carbide tools, use Norton vitrified bonded diamond wheels. Combining fast cutting action with high resistance to grooving, they're often preferred for grinding chip breakers and for precision grinding (cylindrical, surface and internal) of carbide tools, cutters, thread gages, rolls, etc. This Norton engineered bond holds each diamond particle for maximum useful cutting action and long, money-saving wheel life.

For Top Savings On Especially Severe Single Point Tool Grinding and where long life is most important, Norton metal bond diamond wheels are recommended. They're also most economical for many other jobs — such as cutting-off sintered carbide blanks, glass, ceramics, germanium and stone.



For Top Savings In Multi-Tooth Grinding, Norton resinoid bonded diamond wheels hold size completely around cutter after cutter, assuring uniform height to each individual cutter tooth. Their extra fast cutting action and long service life are big advantages in precision sharpening. Two bond types available — regular, for maximum economy in wet grinding and B6, for best results in dry applications.



Making better products... to make your products better

W-1610

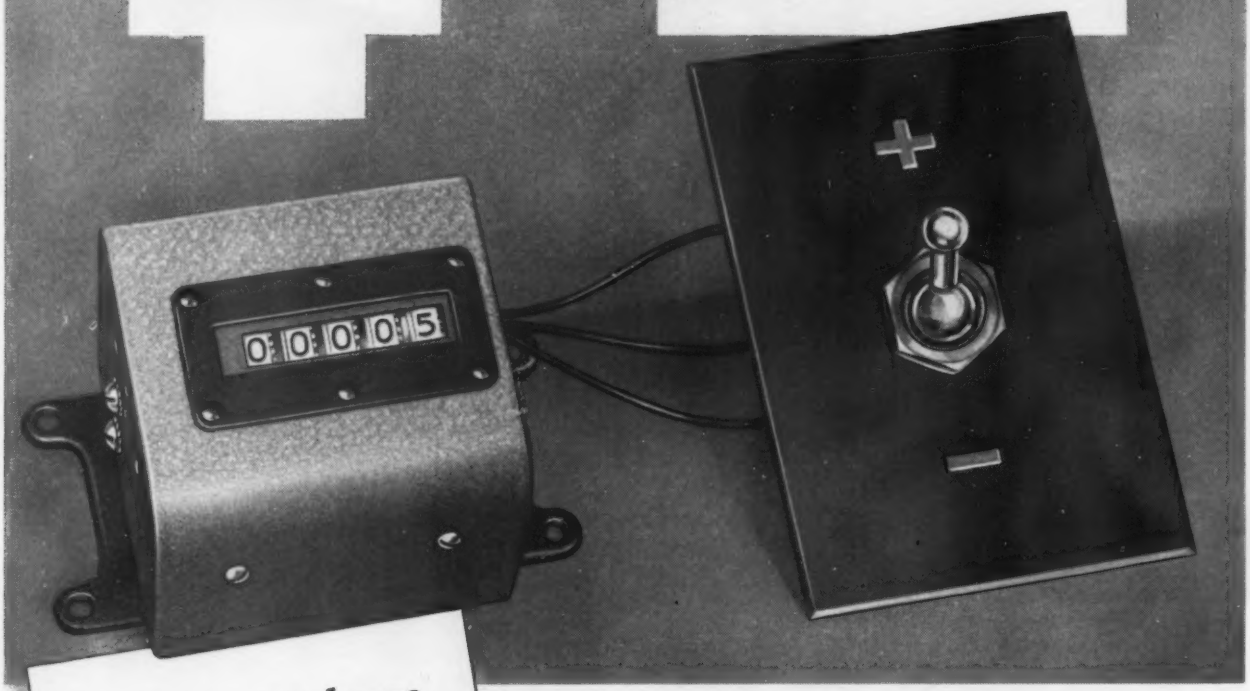
NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

This Magnetic Counter

Adds and Subtracts



Added Evidence that —

Everyone Can Count on VEEDER-ROOT

Flip the switch up . . . the counter adds. Flip it down . . . it *subtracts*. And this 2-way countability makes this new counter a distinct asset to modern systems of automation, control engineering and stock control. Readily adaptable, easily installed and connected to existing circuits, the Veeder-Root "plus or minus" counter is a reliable double-check on the operation of machines, processes, systems. And it's just one of scores of standard and special Veeder-Root Counters for every field of reckoning from atomics to electronics to automation. What is *your* counting problem? Let's put a mathematical eye on it . . . write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

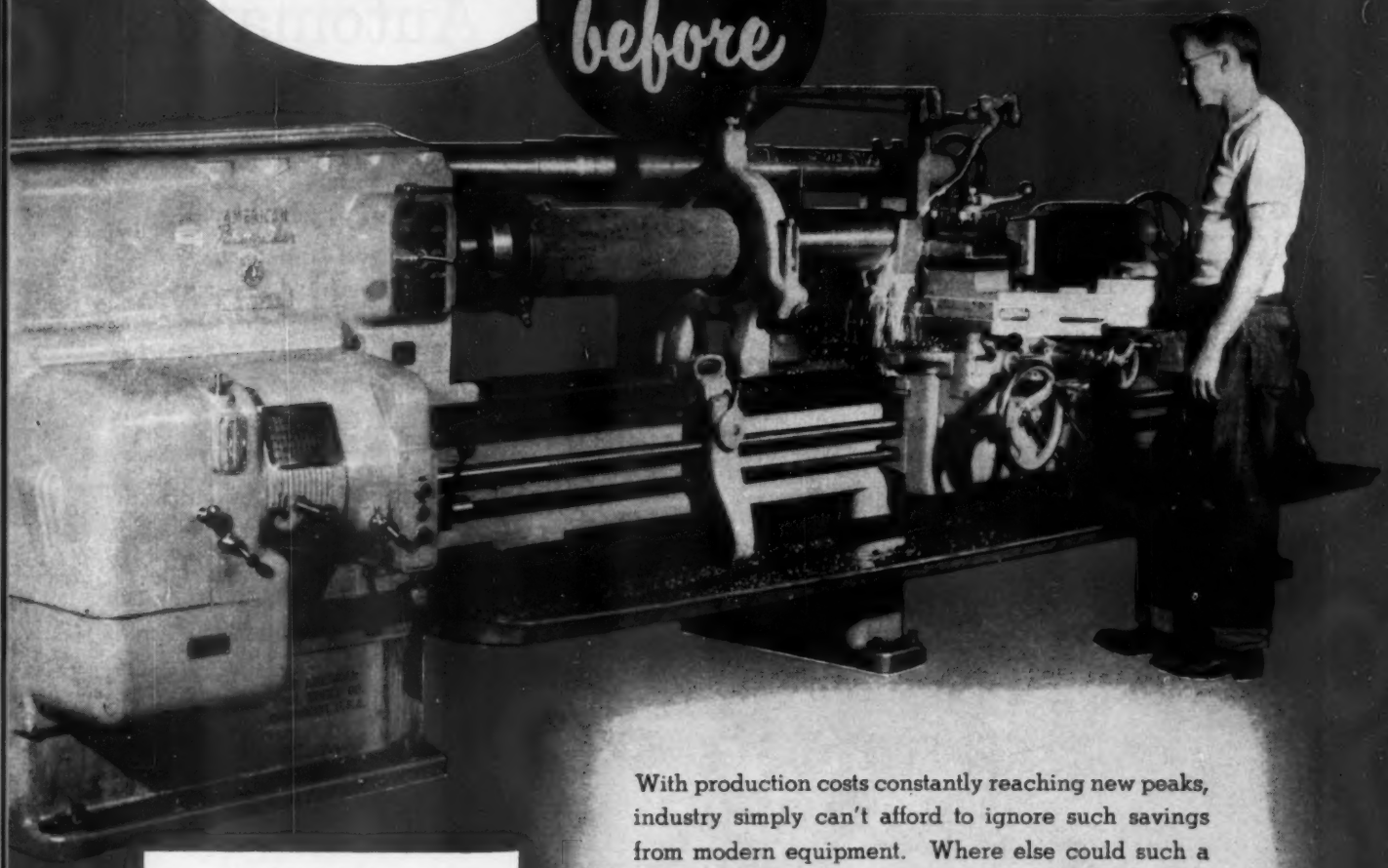
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name that Counts"

2¼ hrs. now

9 hrs. before

Fairbanks, Morse & Co., Beloit, Wisconsin, is *really* putting the payroll dollar to work with its new 20 inch "AMERICAN" Heavy Duty All-Hydraulic Duplicating Lathe.



2000 horse power Fairbanks-Morse motor shafts are now being rough and finished turned in 2¼ hours floor to floor against a former time of 9 hours per shaft.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

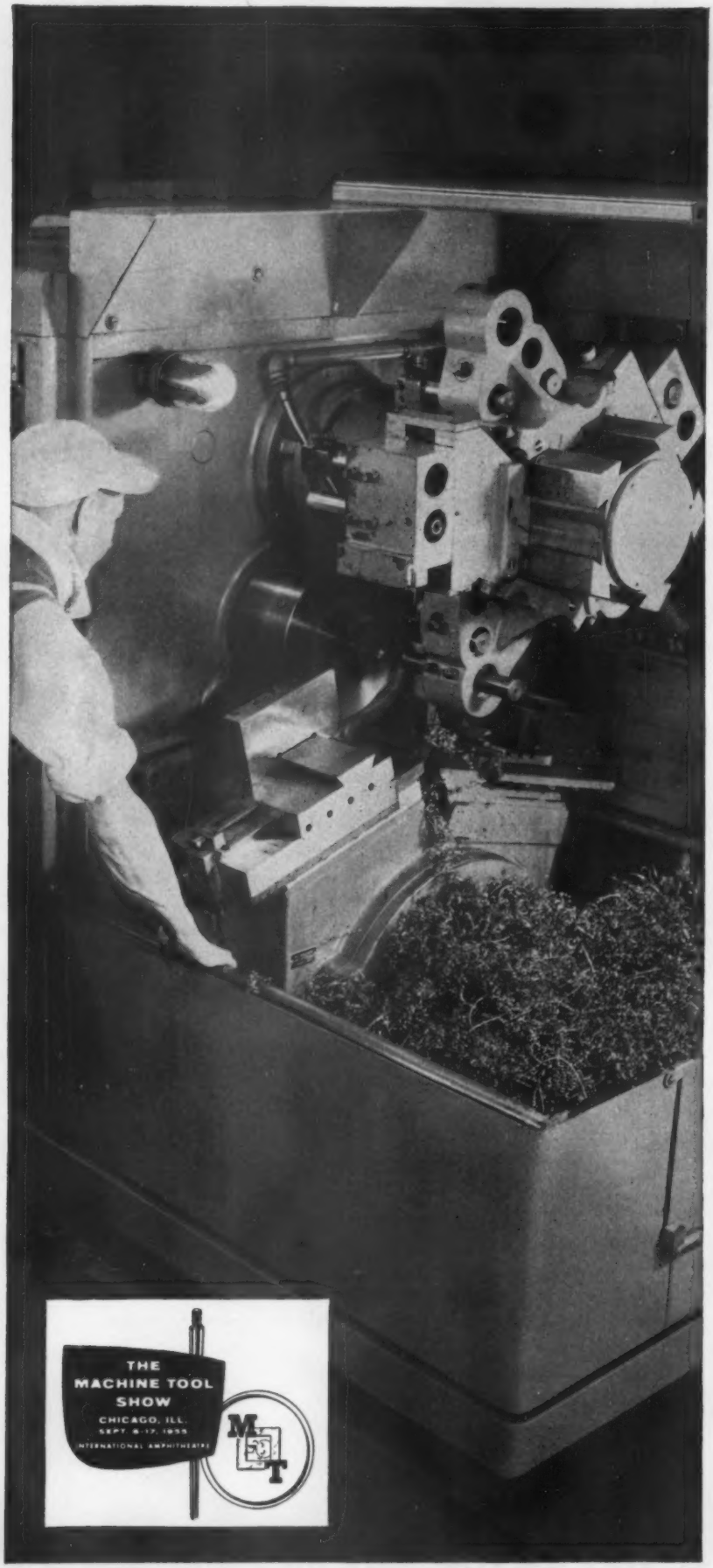
More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

Put your payroll dollar to work for greater profits with "AMERICAN".

Bulletin No. 35 shows many examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



Do Automatics Pay off for the Small Shop?

SKIDMORE-WILHELM Manufacturing Company, a 23-man job shop, will give you an enthusiastic "yes" to this question! And they can give you dollars and cents *proof* of their answer!

This progressive 11-year-old Cleveland company installed a Warner & Swasey 1 AC Single Spindle Automatic 3 years ago to speed up some of the turret lathe work on the many different jobs they turn out. They have since added one more 1 AC and one 2 AC.

Increase Capacity

With these Automatics they have been able to increase their capacity in the existing plant, speed up work, and cut costs. These cost savings, passed along to customers, mean lower quotations on jobs — which just naturally means more jobs coming into the Skidmore-Wilhelm shop, more profits.

YOU CAN PRODUCE IT

Small Lots Profitable

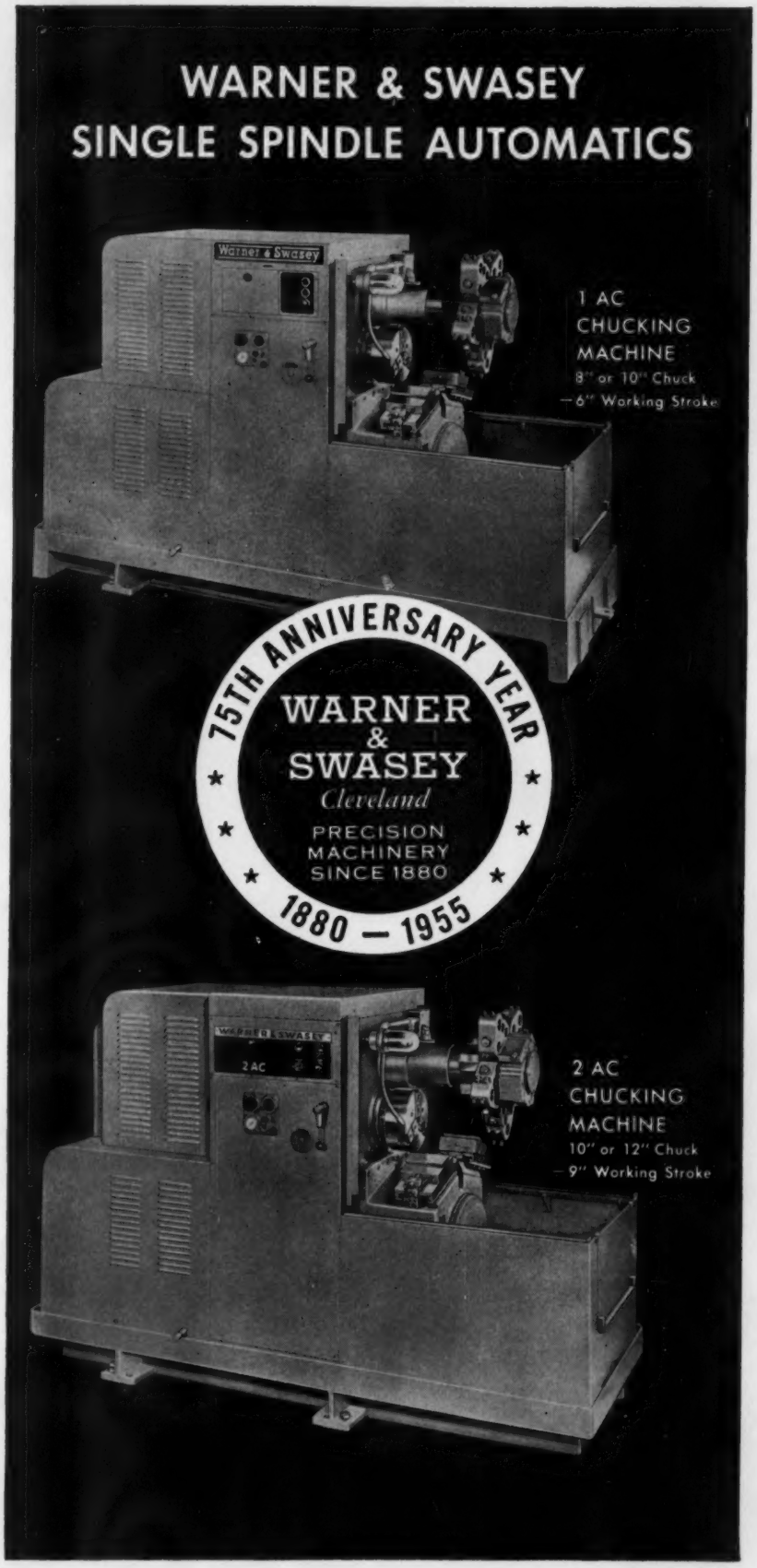
In the face of traditional stiff job shop competition, this company has found that these Warner & Swasey Automatics are profitable on runs as small as 100—sometimes even smaller, depending on the complexity of the operations involved. As a recent promotion folder states about their use of the Automatics, "We use lots of multiple cuts." And, of course, on longer runs the machines' automatic operations pay off even more!

Speed Operations

As a rule one man operates two of the Automatics while the second operator sets up the third machine. Setup time averages about 2½ times that of a turret lathe, but as R. H. Skidmore, Chief Engineer, says, "The Automatics more than make up for it in their faster running time. They're just more profitable all the way around, even when you have to figure in amortization of their higher cost".

Most jobs here can be run in 60 to 70% of turret lathe time. J. W. Wilhelm, General Manager in Charge of Sales, commented on work speed-up this way, "Since we bought these Automatics, our cut-off saw can't keep up with production. And this never happened before".

But regardless of the size of your shop, an analysis of your work will undoubtedly prove that many of your present turret lathe jobs can be handled more efficiently, more profitably on a Warner & Swasey Single Spindle Automatic. Call in your *turning specialist*—your Warner & Swasey Field Representative—let him show you how an Automatic can improve your operations and boost profits!



BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

SAVE TIME IN TRACING,
HYDRA-TRACE

TURNING, FACING

with Hydra-Trace* *and your LeBlond lathe!*

Check the job list of most any LeBlond Lathe—Hydra-Trace combination. You'll find it turning complex dies in the morning, step shafts in the afternoon. Yesterday, it was contour facing compressor discs; tomorrow, turning bevel gear blanks. And saving time on every one!

Hydra-Trace can be mounted in place of the compound rest on most any LeBlond Lathe . . . *in minutes.* It swivels to the most favorable angle for proper tool clearance. Its flat template is easily made, conveniently stored. Template holder and all controls are neatly located at front of lathe. And you can remove Hydra-Trace to use your lathe for other work in practically no time at all!

For complete data on Hydra-Trace, ask for Bulletin HT-2A

American Brass saves 91% of a 6-hour job! Turning mandrels shaped like baseball bats (used in drawing seamless tubing) ate up 6 hours of lathe and operator time at The American Brass Co., Waterbury, Conn. With Hydra-Trace installed on their LeBlond 16″ x 78″ HD lathe, it's done in 30 minutes! And the same lathe, with Hydra-Trace removed, is still available for regular turning, facing and chasing!

If variety is important in your lathe operations, you can't do better than Hydra-Trace and a LeBlond lathe. We'll tell you promptly whether Hydra-Trace will fit the LeBlond you have. Or we can recommend *exactly* the right combination for your requirements from scores of lathe sizes and models. See your LeBlond Distributor or write Cincinnati today.

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

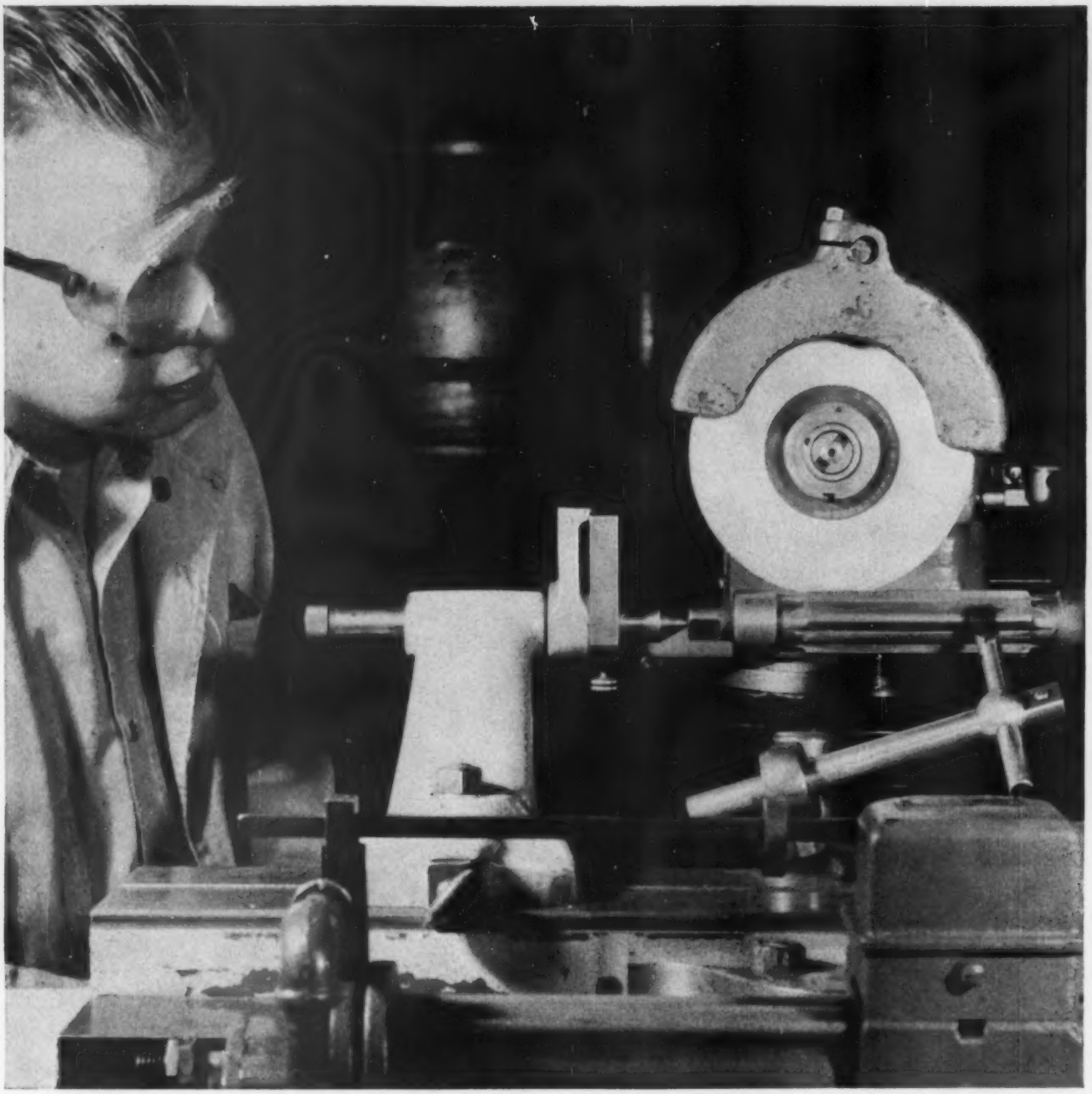
*Hydra-Trace (Trade Mark registered U. S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment. Can be mounted in place of compound rest on practically all LeBlond lathes built since 1935.

. . . cut with confidence

Be sure to see LeBlond, Booth 1313

LEBLOND *of Cincinnati*

World's Largest Builder of a Complete Line of Lathes • For More than 68 Years



From start to finish with **ONE** *set-up...*

ASK YOUR CARBORUNDUM DISTRIBUTOR or salesman for a demonstration of these outstanding new wheels in your own shop, on your own tools. He's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels" and offers expert counsel plus fast, dependable service on all your grinding needs.

FREE FOLDER AND WALL CHART! Gives recommended V40 wheel gradings for grinding high speed tool and die steels. Write The Carborundum Company, Dept. AM 81-56, Niagara Falls, N. Y. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

use **V40** *bond* **TOOL ROOM WHEELS**

HOLDS FORM, YET EASY TO DRESS! Here's the tool room wheel that does *more work* more of the time than any other wheel you can use. The superior form-holding ability of **V40** eliminates costly stops for wheel dressing and re-setting-up halfway through a job. Yet...when dressing between jobs, the special vitrified bond composition permits faster, easier dressing—with substantial savings in diamonds, time and abrasive.

COOLER, FASTER CUTTING! V40 Bond Wheels cut exceptionally cool and free, even on high speed steels and hi-vanadium types. They are available in every type of wheel (straight, recessed, straight cup, flaring cup, dish, saucer) for every tool room grinding operation.

EASY TO IDENTIFY, EASY TO ORDER! Pure white aluminum oxide grain and the bright red blotter give **V40** wheels a distinctive appearance. They're easy to order, too...you can usually specify **V40** Bond Wheels in the same grit and grade as wheels you are now using.

CARBORUNDUM

REGISTERED TRADE MARK

...continually putting more **SENSE** *in your abrasive* **DOLLAR**

81-56

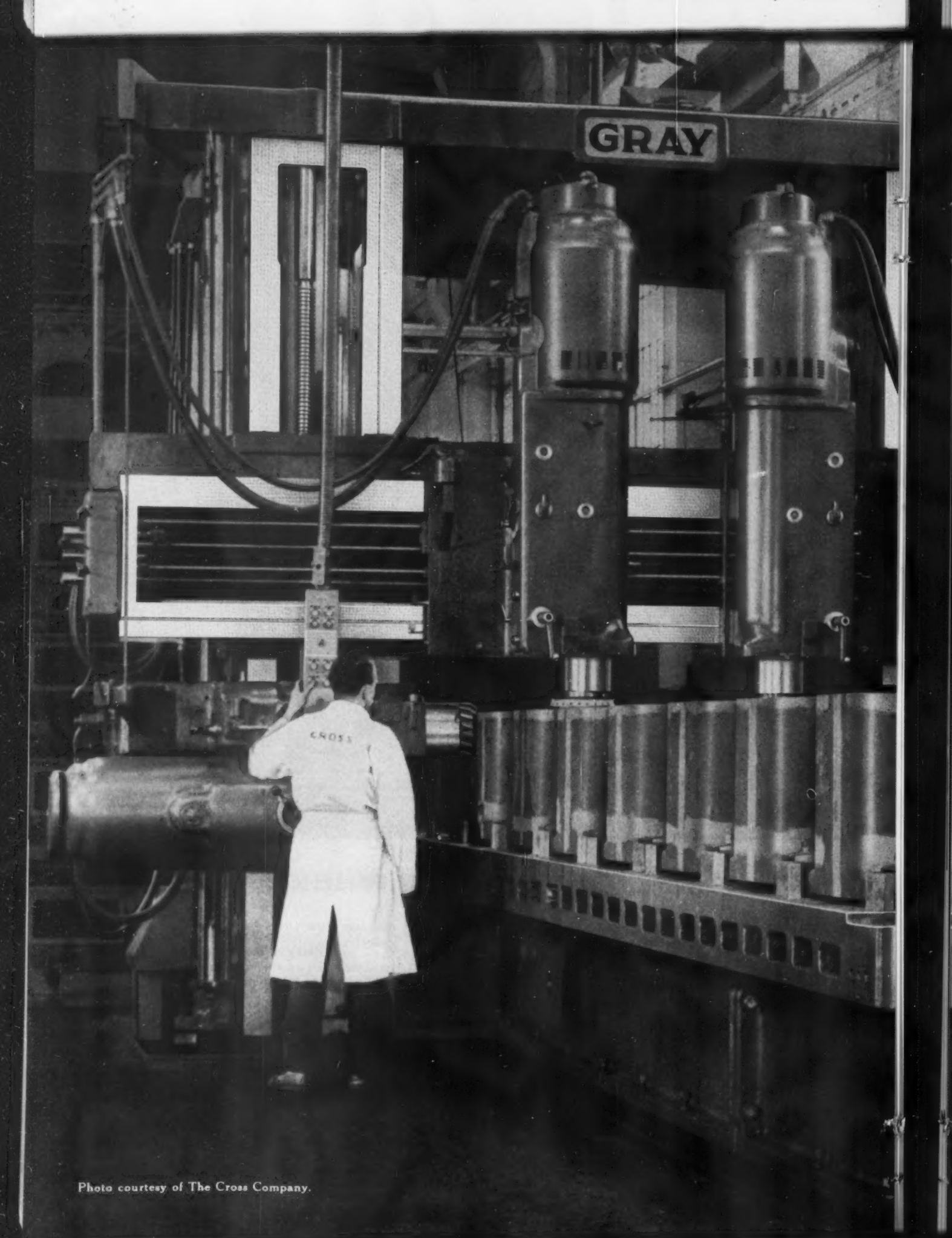
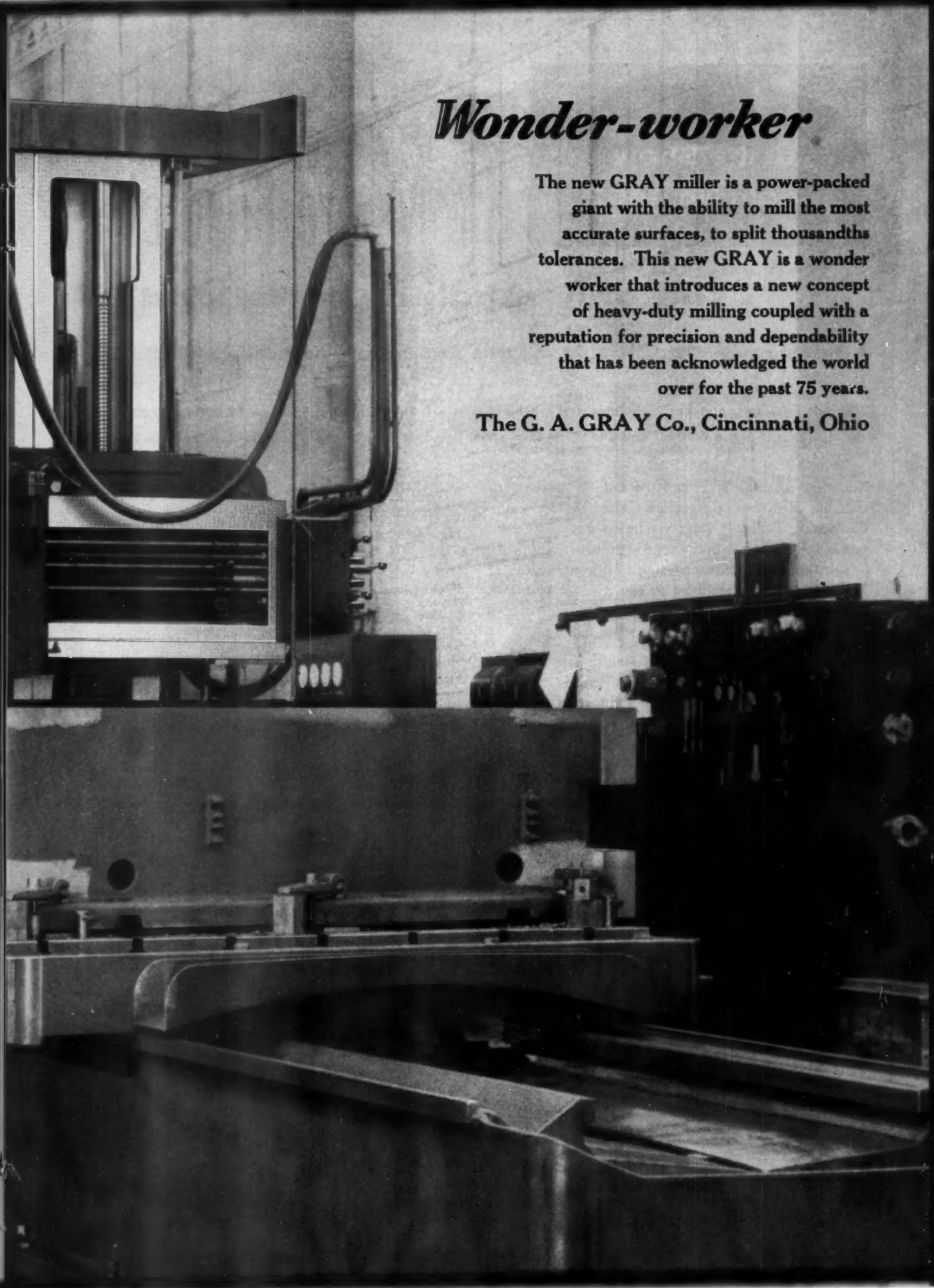


Photo courtesy of The Cross Company.



Wonder-worker

The new GRAY miller is a power-packed giant with the ability to mill the most accurate surfaces, to split thousandths tolerances. This new GRAY is a wonder worker that introduces a new concept of heavy-duty milling coupled with a reputation for precision and dependability that has been acknowledged the world over for the past 75 years.

The G. A. GRAY Co., Cincinnati, Ohio

See it at the Show Booth No. 1402

the Moore-Fosdick

The only machine of its kind in

• Greater range—22" x 42" x 27" height • Automatically positions work to ±.0001"

• Grinds jigs, dies, punches, templates and machine parts • Infinite Grinding Speeds—12,000 to 60,000 rpm • Contour and Chop Grinding • Slot Grinding Attachment • Spindle-Housing Heat Control

This new machine combines the unique Moore Jig Grinding Head with the exclusive Fosdick Automatic Positioning Table. It gives you greater capacity for precision grinding with the speed and convenience of a table that automatically positions work to ± .0001". *There is no other machine in the world that even approaches the Moore-Fosdick in jig-grinding capacity, versatility, convenience and precision!*

Grinds Cylindrical and Tapered Holes. The Moore-Fosdick allows you to grind cylindrical as well as conical holes, with taper in either direction. An angular and indexing device built into the main spindle, and the newly developed slot grinding attachment, permit the quick, accurate grinding of any contour—*regular* or *irregular*.

Large Work Capacity—Infinite Number of Speeds. The Moore-Fosdick A. P. Jig Grinder has an infinite range of grinding speeds – from 12,000 to 60,000 rpm . . . allowing extreme versatility and accurate control of grinding and stock removal. Larger table size and greater work height, coupled with greater power, *extend* the overall range of precision grinding operations.

SPECIFICATIONS

Capacity:	No. 30-G	No. 42-G & No. 42-PG*
Table size	36"x18"	44"x22"
Table travel, Longitudinal	30"	42"
Table travel, Crosswise	17½"	22"
Table top to wheel collet	2" to 27"	2" to 27"
Spindle to column ways	18½"	18½"
Spindle to column below ways	20"	25¼"

Four spindle speeds: 90, 120, 180, 240

Spindle feeds by air-powered hydraulic control—infinite speed control

Grinding speeds: 12,000 to 60,000 rpm; 3 heads

Grinding Capacity:
With grinding wheels, 3/16" to 5" (8" with adapter)
With diamond mandrels 1/64" to 3/16"

Travel main spindle slide... 3⅛"

Angular adjustment of spindle up to 1½° either way or 3° included angle.

Radial offset of grinding spindle-from center to 1⅛" off center by rough adjustment-while running 0.0001" adjustment for distance of 0.075" anywhere in the 1⅛" range.

Weights and Floor Space:	No. 30-G	No. 42-G & No. 42-PG
Machine with regular equipment, including motor	6000 lbs.	11,000 lbs.
Shipping weight	6750 lbs.	12,000 lbs.
Floor space	77"x82"	102"x128"

Standard Equipment:
Four-speed constant torque ¼ hp motor, 220-440 volts, 50-60 cycles, 2-3 phase, wheel dresser—micrometer stop-wrenches. Two built-in locating devices: two 1" .0001 inside micrometers; two 1", 2", 3", 4", 5", 10" and one 15" end measurers in box.

Compressed Air Requirements:
90 to 100 lbs. @ 15 cfm, furnished by customer. We recommend a heavy-duty 7.5 hp air compressor with a water aftercooler, provided it is capable of this output.

*42-PG Moore-Fosdick Jig Grinder with Automatic Positioning.

Write today
for price and delivery information.

Jig Grinder

the world!

Grinding Wheel Outfeed, Reads .0001", Adjustable while running
Cross Power Traverse Safety Switch and Positioning Control
Vertical Slide Taper Setting
Positive Adjustable Depth Stop, Micro Setting
Depth Measuring Dial Reads to .001"
Heating Elements for Continuous Temperature Control of Spindle Housing
Grinding Wheel Outfeed Slide, Course Adjustment
Longitudinal Power Traverse Safety Switch and Positioning Control
Measuring Rods or Duplicating Bars
Push Buttons to Control Table and Slide Rapid Traverse and Positioning of Table and Slide
MOORE-FOSDICK

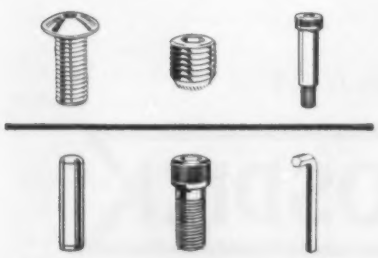
Positions Work Automatically to ± .0001". With the Automatic Positioning Table, you can get fast and accurate positioning of parts to be ground. Two simple duplicating bars may be prepared to position work automatically to ± .0001" — at the touch of a pushbutton. This means that complex grinding jobs with hundreds of holes require only one set-up. On "one-time" jobs, measuring rods can be used in place of bars. For precision production jobs, the easily-made, easily-stored duplicating bars give you a permanent record of positions. Once a job is run, you store the bars and use them every time you rerun that same job — weeks, months or years later.

Grinder Head Dimensional Stability. Latest design of the grinding head incorporates new features to improve further its stability. These include: (1) Electric heating elements in the main spindle housing to maintain uniform temperature whether machine is running or not; (2) An observation thermometer so located as to indicate any temperature change within the housing; (3) The housing itself is cast from 36% nickel iron to reduce the effect of any possible temperature variation to an irreducible minimum.

Need Drilling Equipment? Get a Proposal from Fosdick!

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO



FINISHING OFF WITH UNBRAKO FLAT HEADS. Holding a thin-section assembly together, and finishing it off with a smooth, good-looking surface is a job for UNBRAKO Flat Head Socket Cap Screws. These precision socket screws are designed for such applications. Heat treated alloy steel provides the strength. Uniform 82° angle under the head assures maximum contact. Accurate hex sockets prevent marring of the screw head or assembly surface. And these UNBRAKOs are easy to get—they are stocked by authorized industrial distributors everywhere. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION sps JENKINTOWN, PENNSYLVANIA

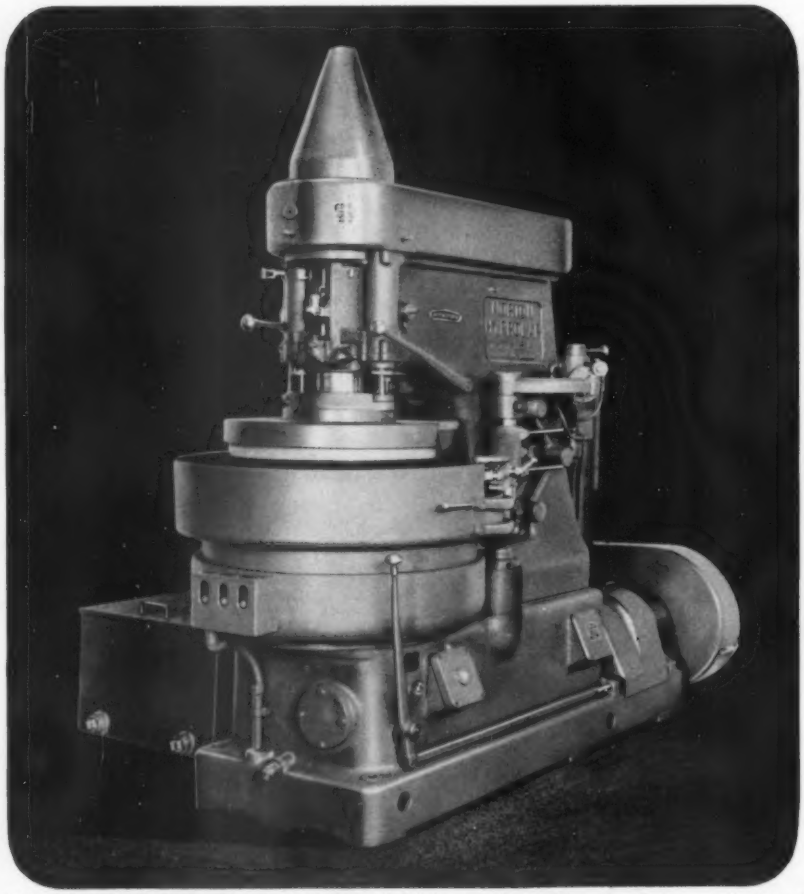
...and the work they do

SEE INSIDE

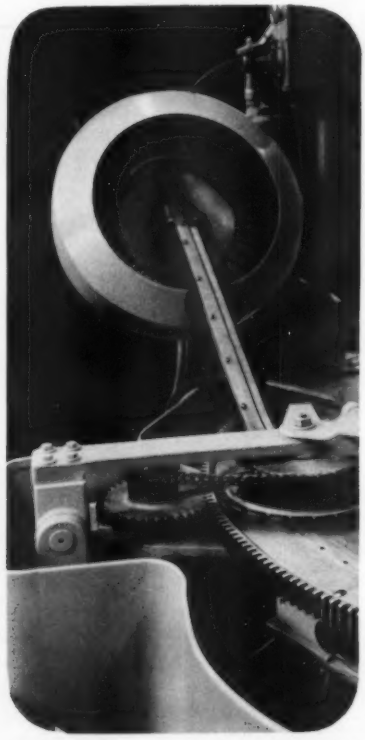
NORTON LAPPING MACHINES meet the widest range of applications with SPEED...ACCURACY...ECONOMY

Hyprolap High Production Lapping Machines*

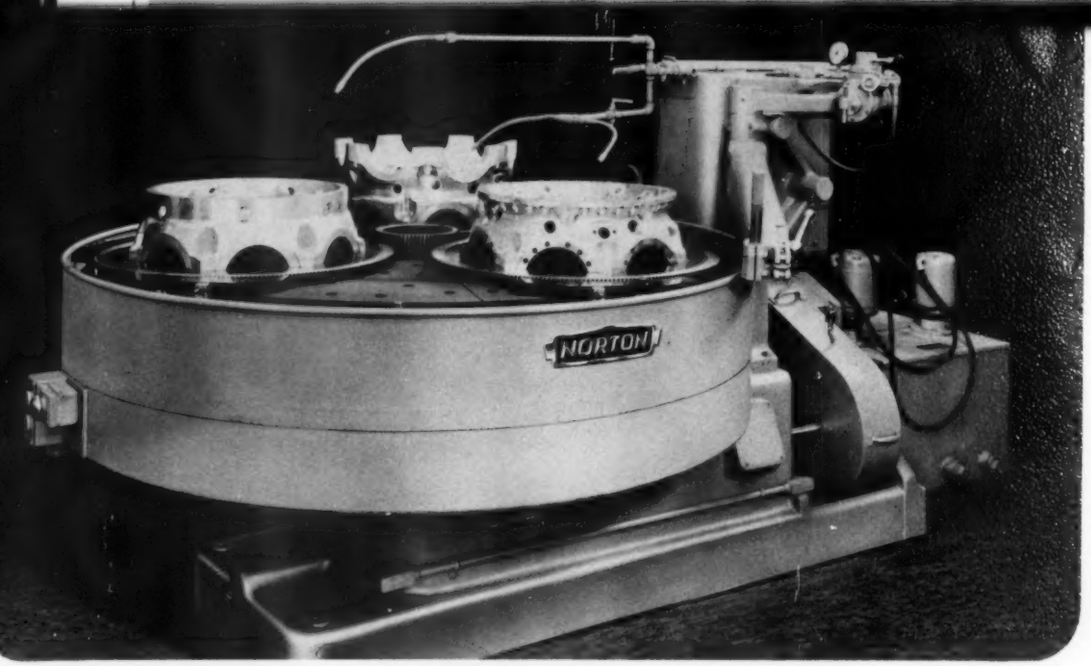
As their name indicates, these machines are specifically designed for extremely fast, high production lapping. Eliminating loose abrasives, their bonded abrasive laps produce workpieces free of grit or foreign matter. Adding up their advantages you get a combination of money-saving speed, accuracy and uniformity of finish obtainable in mass production by no other method. Four of the most popular Hyprolap Lapping Machines are shown here.



NO. 26 HYPROLAP LAPPING MACHINE. A high speed machine for flat or cylindrical lapping that finishes from 5 to 100 or more workpieces simultaneously. Lapping pressure is hydraulic powered and controlled — an exclusive Norton development. Other features include direct motor drive for laps and pumps and a hydraulic controlled truing arm. Work capacity: up to 3″ thickness or diameter, to 7½″ length.

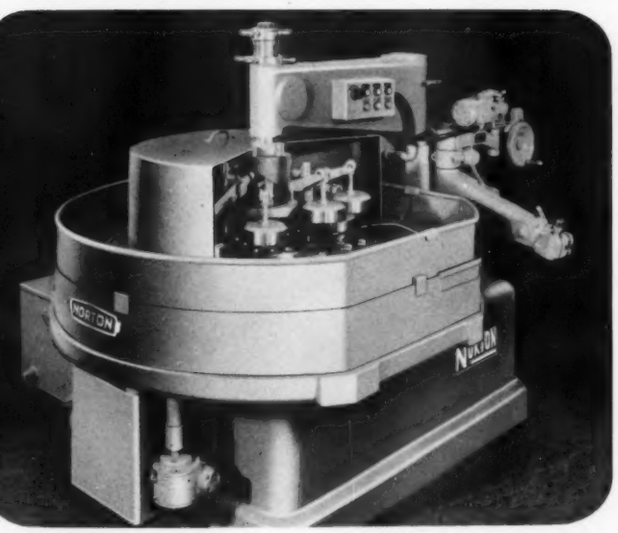


THRU-FEED NO. 26 HYPROLAP LAPPING MACHINE (guards removed to show details). 10-to-1 savings proved in finishing two opposed flat surfaces simultaneously on small parts at a rate up to 8,000 pieces per hour due to uninterrupted lapping. Filling of feed hopper and removal of finished work tray are the only manual functions required. Feed is entirely automatic. High worker skills unnecessary.

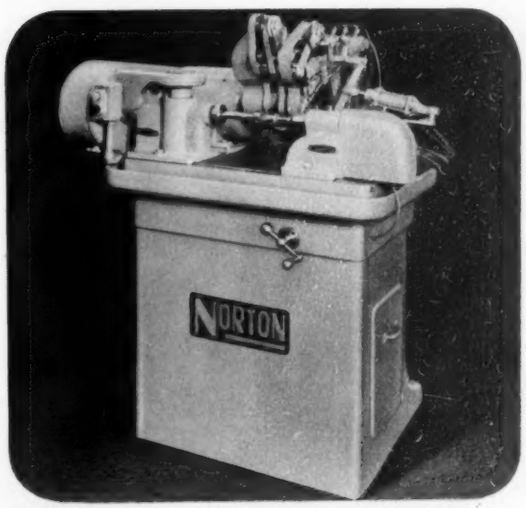


Three Additional Lapping Machines

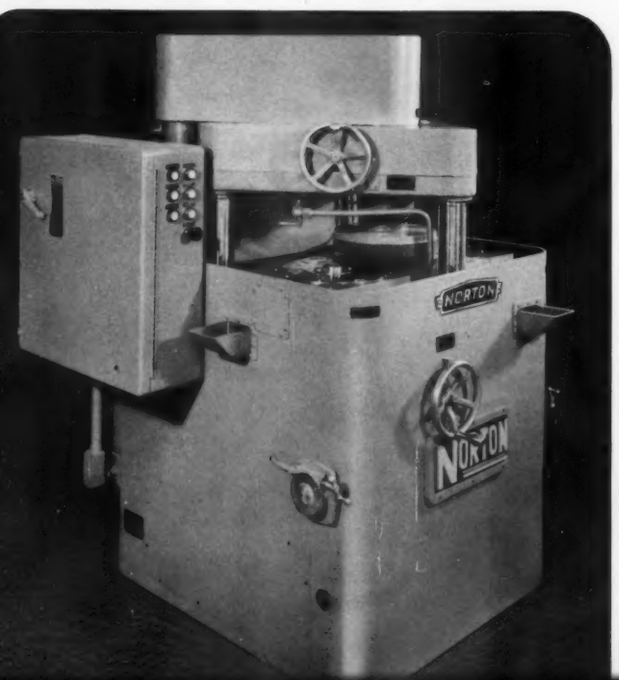
Whatever your requirements may be, here is further evidence that there is a *right* Norton lapping machine to give you maximum output and minimum downtime — with higher quality work and less dependence on manual skills.



HYPROLAP SINGLE FACE FLAT LAPPERS NO. 60 (Above) AND NO. 36 (Left). Sensational performers, particularly on soft metals. Provide seal surfaces, wear surfaces or reference surfaces for further machining. Arrangements are: plain timed cycle; automatic continuous feed; semiautomatic continuous feed. Power-operated truing arm and loadless-starting, inertia-delay clutch are advantage features. Available with hydraulic pressure device for lapping light workpieces. Load capacity for the 60″ machine is: up to three 24″ pieces or one 60″ piece; for the 36″ machine, up to three 11″ pieces or one 36″ piece. Proportionately larger loads for small workpieces.



SIMPLEX SURFACE FINISHER NO. 12. A highly efficient machine that uses flexible coated abrasives. This method of surface finishing is ideal for handling small crankshafts for refrigerator compressors and outboard motors, eccentric and concentric cylindrical surfaces, journals and seal surfaces on many cylindrical parts. Capacity range: ½″ to 2½″ diameter, up to 12″ length.



NO. 12 HYPROLAP LAPPING MACHINE. A parallel face flat lapping machine for small work. Available in three arrangements: plain, timed cycle; automatic continuous feed; semiautomatic continuous feed. All three provide fast lapping, because of the efficient action engineered into the basic machine. With all arrangements, the machine is designed to provide selective lap speed and selective work holder speed. This provides flexibility, permitting precise setting of ideal speeds for each job. With all arrangements the cleanliness of the finished surfaces — particularly on parts comprised of soft metals — eliminates the need for cleaning operations, with resulting savings in time and costs.

Get The Whole Story

on how Norton lappers produce finer, smoother, more accurate finishes in less time — benefits that add to the satisfaction of ultimate users of your products while increasing your own profit margin. See your Norton Representative or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

To

Making bett

District Sales Offic
Cleveland - Chica

ING MACHINES meet the
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CURACY...ECONOMY

p* High Production
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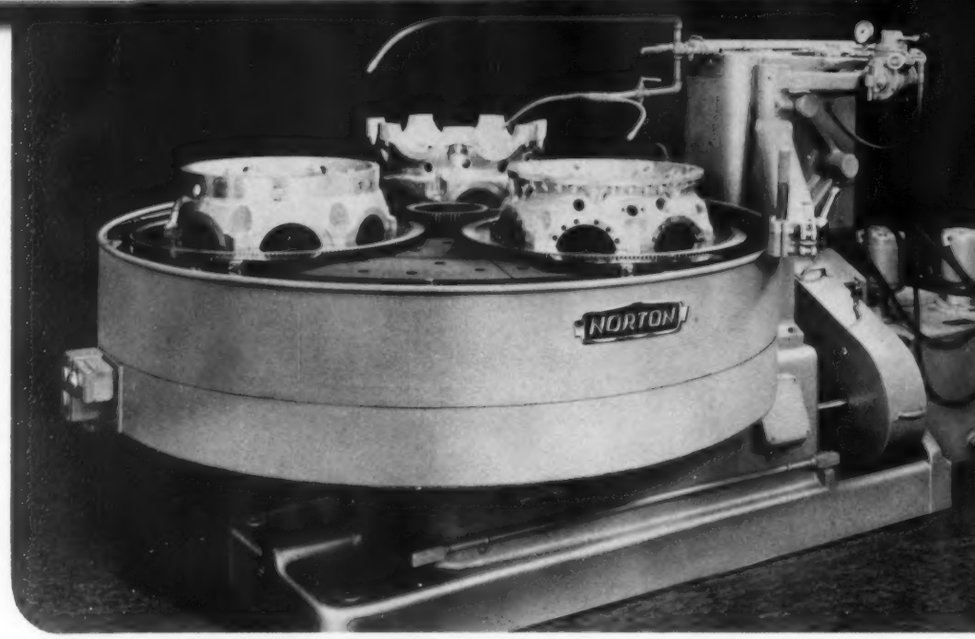

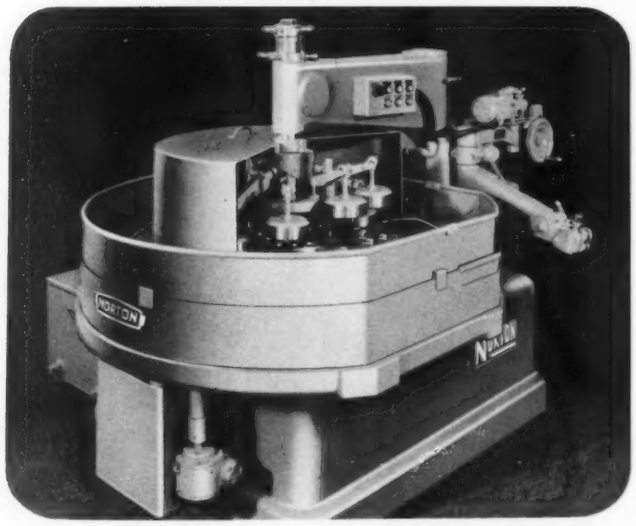

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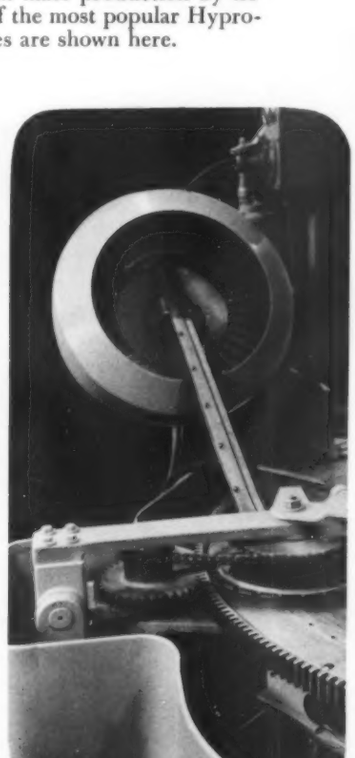

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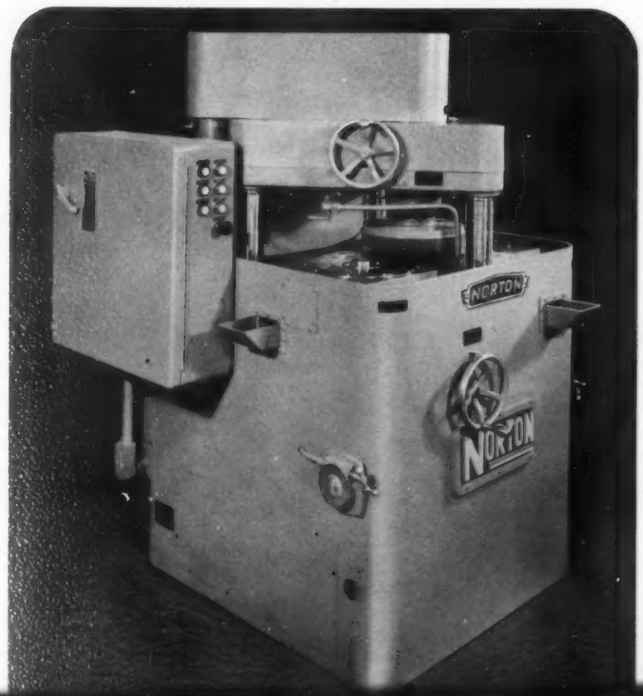

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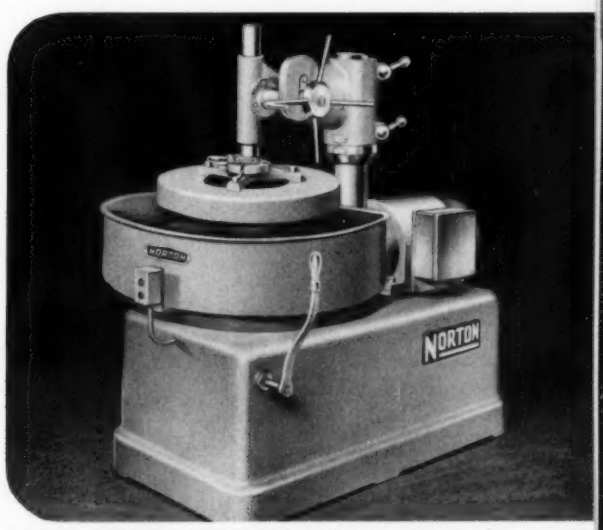
Three Additional Lapping Machines

Whatever your requirements may be, here is further evidence that there is a *right* Norton lapping machine to give you maximum output and minimum downtime — with higher quality work and less dependence on manual skills.

VERTICAL LAPPING MACHINE NO. 16FC. An outstanding performer for flat or cylindrical work, such as Diesel injector parts, plug gages, size blocks, the sides of rings and short cylindrical parts. Using cast iron laps, it produces optically flat surfaces to extremely close thickness tolerances. Its fine repetitive accuracy helps reduce inspections and eliminates the need for selective assembly. Capacity range: 3″ x 5″ flat and 3″ diameter cylindrical.

SIMPLEX SURFACE FINISHER NO. 12. A highly efficient machine that uses flexible coated abrasives. This method of surface finishing is ideal for handling small crankshafts for refrigerator compressors and outboard motors, eccentric and concentric cylindrical surfaces, journals and seal surfaces on many cylindrical parts. Capacity range: ½″ to 2½″ diameter, up to 12″ length.



PLAIN TIMED CYCLE LAPPING MACHINE NO. 28. Produces flat or cylindrical surfaces within extremely close tolerances and to a high degree of finish. Uses cast iron laps with loose abrasive. An attachment for cylindrical lapping is furnished with the regular flat lapping arrangement. Capacity range: flat, 4″ thick x 9″ long; cylindrical, 4″ diameter x 9″ long. An arrangement for hand lapping with 30″, 36″ or 40″ cast iron laps is also available.

Get The Whole Story

on how Norton lappers produce finer, smoother, more accurate finishes in less time — benefits that add to the satisfaction of ultimate users of your products while increasing your own profit margin. See your Norton Representative or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

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GRINDERS and LAPPERS

Making better products . . . to make your products better

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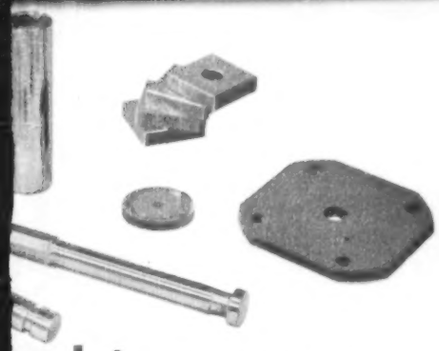

othing your way
r Profits

more and more applications, lapping is resulting in better , longer lasting products than could ever be produced by ary surface finishing methods. Thus, lapped products offer e advantages to all who make, sell or use them.

the inherent advantages of lapping, Norton lapping machines eir own "Touch of Gold" — the Norton *extra* that improves oduct quality and at the same time increases your produc- For example, Norton lappers produce:

Superfine surface finishes at production rates, to optical flatness.

Longer wear-life for lapped parts because of more thorough removal of surface roughness and geometrical irregularities, which would otherwise have to be removed by "running in".

More effective liquid- and gas-tight seals without the aid of gaskets, and between piston and cylinder without the aid of rings.

Planes finished to precision accuracy, for reference surfaces.

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of these top-performing machines are shown on the oppo- . Each includes many advanced features . . . each is easy to and maintain . . . and each is engineered to provide the ficient and economical lapping obtainable within its own ar job range. It will pay you to look them over carefully, get further facts on how Norton lappers can add the time- ney-saving "Touch of Gold" to your own production.

rton Machine Lease and Purchase Financing Programs

cost of replacing obsolete equipment with new lapping ma- s delaying your plans for modernization, investigate the Machine Lease Program — three tested plans that enable nodernize while conserving your capital. Or look into the Financing Plan, under which you may take up to five years for income-producing equipment. And remember, only offers you such long experience in finding machines and wheels to u produce more at lower cost.

NORTON

NORTON LAPPING MACHINES

...and the work they do

SEE INSIDE

The Norton Job Lapping Department...

A PROVING GROUND FOR INDUSTRY

Since its start two years ago the Norton Job Lapping Department has had to be considerably enlarged to take care of the growing volume of orders. Through this vital service many manufacturers have found that difficult or unsatisfactory machining operations could be eliminated by lapping, have proved the practicability of suggested limits for surface finish or dimensional accuracy of new products, or have tested the value and economy of lapping in other ways.

Complete and modern in every detail, the Department contains machines for every type of lapping, operated by expert personnel. Results are checked on the latest inspection equipment, while precision accuracy is further assured by careful atmosphere control. The extensive job-range covers the following:

Materials — practically unlimited in range, including hardened steel, stainless steel, stellite facings, cast iron, non-ferrous pressed and die-cast parts.

Types of Lapping. Single and parallel face flat lapping, to specifications for dimensions and for surface finish ranging from stock removal to optical flatness. Also external cylindrical lapping to high precision requirements.

Workpiece Capacities. Flat work up to 24″ across. Cylindrical work from 1/16″ diameter x ½″ long to 2″ diameter x 8″ long.

Why not find out how precision lapping can improve your own product quality and cut your production costs? The Norton Job Lapping Department is ready to finish parts to your exact specifications, and to work out the best technique for your requirements. Full details on request.

A corner of the Norton Job Lapping Department. Flat work up to 11″ across can be handled on machines at left. The machine at right takes workpieces up to 24″ diameter. Other photo shows typical parts handled by the Department.

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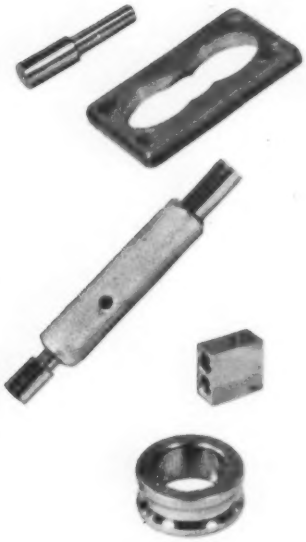
Smoothing your way to Bigger Profits



For more and more applications, lapping is resulting in better fitting, longer lasting products than could ever be produced by ordinary surface finishing methods. Thus, lapped products offer definite advantages to all who make, sell or use them.

To the inherent advantages of lapping, Norton lapping machines add their own "Touch of Gold" — the Norton *extra* that improves your product quality and at the same time increases your production. For example, Norton lappers produce:

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- Planes finished to precision accuracy, for reference surfaces.

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NORTON

SEE INSIDE

...and the work they do

The Norton Job Lapping Depart

A PROVING GRO
FOR INDUSTR

Since its start two years ago the Norton Job Lapping Department has had to be considerably enlarged to take care of the growing volume of orders. Through this vital service many manufacturers have found that difficult or unsatisfactory machining operations could be eliminated by lapping, have proved the practicability of suggested limits for surface finish or dimensional accuracy of new products, or have tested the value and economy of lapping in other ways.

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NORTON

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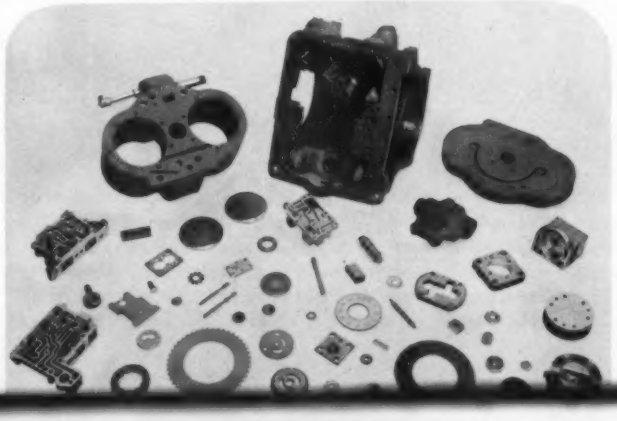

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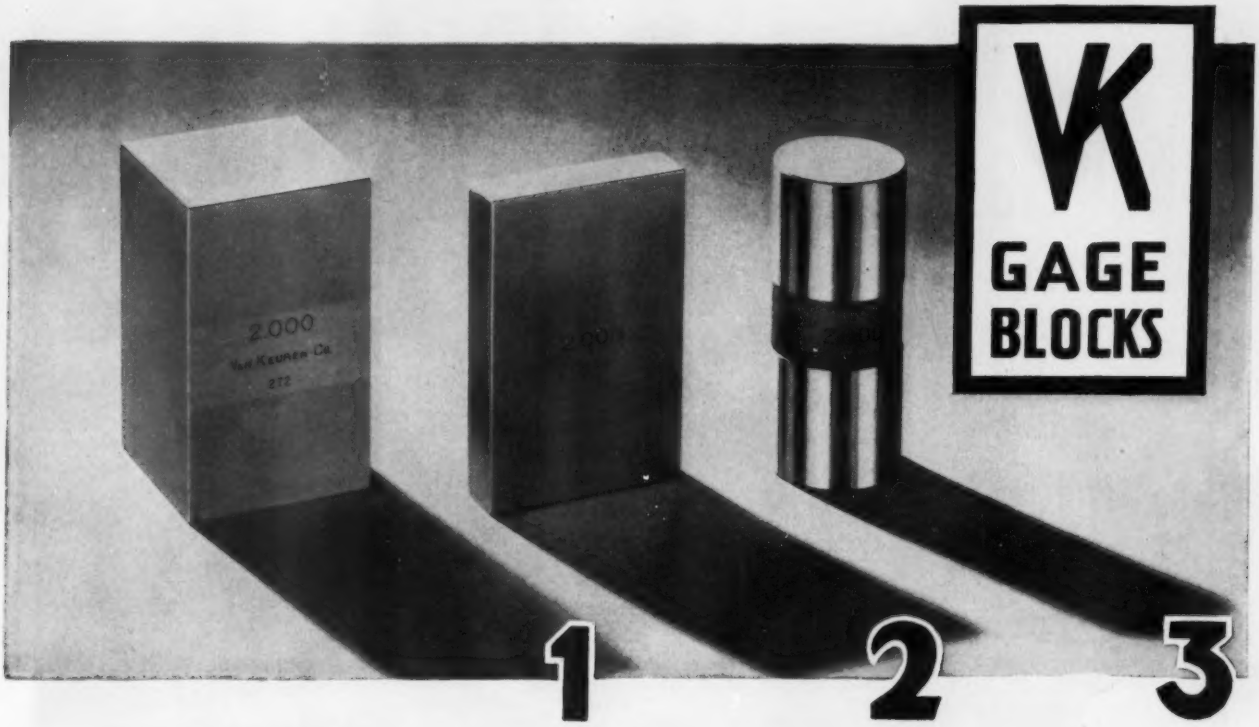


THREE WAYS *to protect production accuracy*

To meet closest limits of accuracy and protect production, Van Keuren is currently furnishing three types of gage blocks:

1—SOLID SQUARE MASTER BLOCKS
2—RECTANGULAR REFERENCE GAGES
3—MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision setup work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are now made to an accuracy of .000008" and are designed as working gages for shop use . . . to put accuracy at the machine. Wearing surface of these ⅞" diameter gages is 40% greater than that of rectangular gage blocks hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

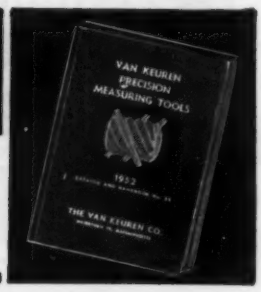
VK

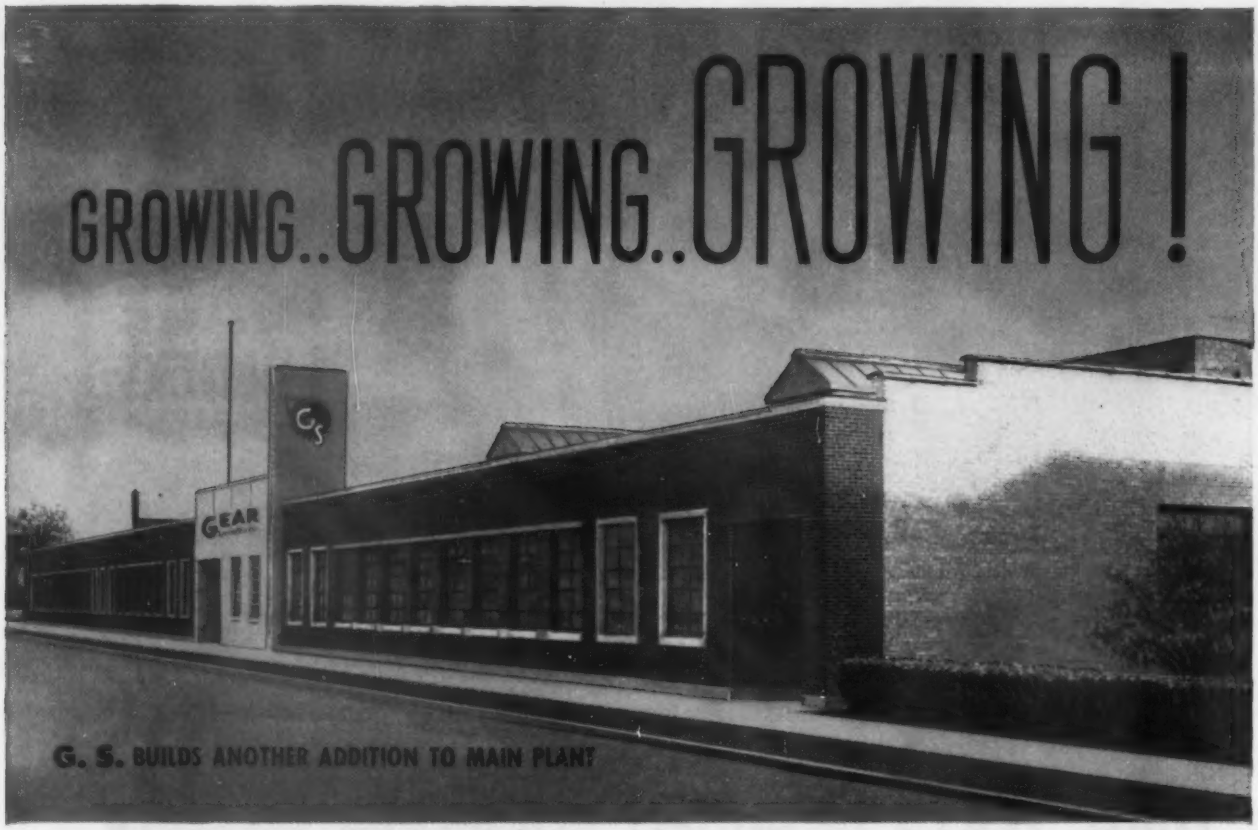
36th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages.





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2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS
OF FRACTIONAL HORSEPOWER GEARING

More Space To Better Serve Our Customers

A big, modern addition to our main plant has just been completed. This major expansion was made necessary by the rapidly increasing demand for G. S. Small Gearing by more and more of our country's most critical buyers. New customers as well as those we've served for many years can expect better service, even better Gears, and greater efficiency.

Now, more than ever, G. S. enjoys the enviable position of *"world's largest exclusive manufacturer of fractional horsepower Gearing"*. Thirty nine years of specialization . . of developing and perfecting mass production methods and machines . . has resulted in maintaining a degree of accuracy unapproached in the history of fine Gear making!

Profit by depending upon our expert staff and enlarged facilities for quick, correct answers to ALL your Small Gearing problems. Will you tell us today, please, exactly what you need?

GET G.S. TECHNICAL DATA *Free!*

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

YOU DON'T CUT ANY FASTER...

you just finish the job sooner

and at lower cost per piece

Most *good* modern machines will cut as fast as today's carbide and high-speed tools will take it, so your actual time per cut will be the same, regardless of the machine you use. But when you put jobs like this on an

Acme-Gridley Fully Automatic Turret Lathe

you *finish them faster* because non-cutting (idle) time is accelerated and controlled. The complete machining cycle is entirely automatic and predetermined—to give the minimum time per piece, on *every piece*. Machining is done at the surface speed best suited for required finish and tolerance because each toolslide is independently cammed and selective spindle speeds are automatically controlled.

Ask us to show you how *automatically controlled cycle** can turn non-productive "idle" time into savings like this—on your jobs.

JOB FACTS

- **PACKING GLAND NUT from 4¼" round 1112 C.D. Steel.**
- **12 OPERATIONS (with 9 tools) including threading and tapping.**
- **FORMER METHOD produced 409 pieces in 192 hours on hand operated machine.**
- **ON MODEL M ACME-GRIDLEY—325 pieces in 48 hours.**
- **SAVINGS—7 to 2 production increase at better than 3 to 1 savings in cost per piece.**

Automatically controlled cycle

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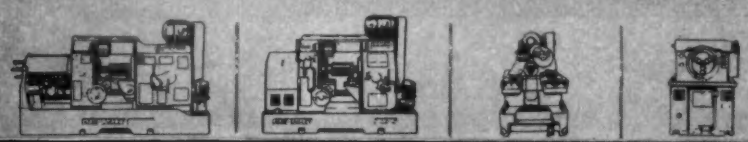

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Are Your Fasteners HEADED FOR TROUBLE?

Screws are sometimes like people. If they "lose their heads" under pressure — if they turn out to be "softies" — if they don't "square up," they are *headed for trouble*. It takes only a few "bad" screws on the line each day to erase most planned assembly savings.

That is why quality standards for P-K Self-tapping Screws were set so *high* when they were first introduced by Parker-Kalon. Today, with even *higher standards* they continue to take top honors for dependability, despite many efforts to match them.

The difference between screws made to P-K standards and those that are "headed for trouble" are hard to see at a glance, but the effects of screw failure (parts spoilage, high reclamation costs) are quickly evident in mounting assembly costs.

P-K Self-tapping Screws are "headed for savings"—not only headed, but threaded, pointed, and heat-treated with the same purpose, to keep your assembly lines trouble-free. That's why so many more manufacturers of America's best known products specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer. Or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

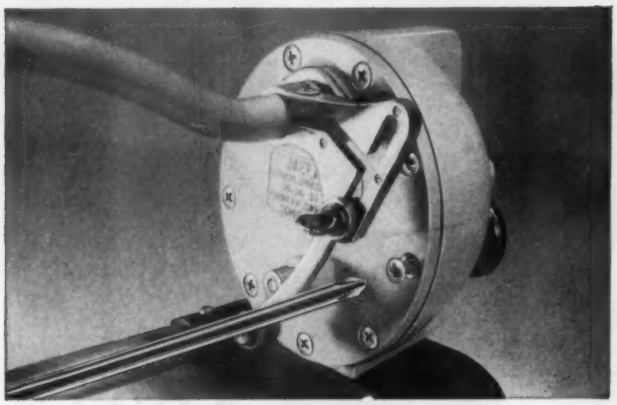
IS HEAD UNDERSIZE?
DO HEADS POP OFF?
IS HEAD ECCENTRIC?
IS SLOT BURRED?
IS SLOT TOO DEEP?
IS SLOT TOO SHALLOW?
IS SLOT OFF CENTER?
P-K STANDARDS make sure you get fasteners HEADED for SAVINGS

P-K STANDARDS protect you against these and many other symptoms of Screws "headed for trouble". They don't "get by" P-K inspectors — that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality."

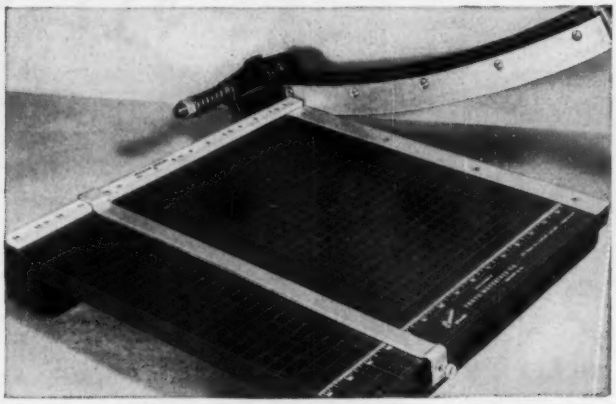
PARKER-KALON®

IN STOCK . . . see your nearby P-K Distributor . . .

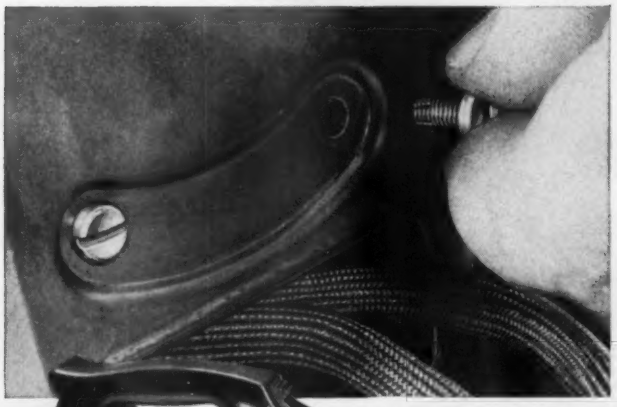
"SWINGIN' SPRAY," MELNOR Products Co.'s popular lawn sprinkler keeps on "swinging" because the oscillating mechanism is separate and sealed from the water intake system. To assure equally dependable assembly strength resistant to the roughest handling, Melnor fastens zinc and aluminum parts with P-K Screws, 7 Phillips Head Type Z and 18 Type F, driven with air tools.



IN THE PREMIER CUTTING BOARD, made by Photo Materials Co. when 21 P-K Type A replaced wood screws to fasten the ruler, straight blade, bearing casting, and bottom cleats to the hard maple board, pilot holes were eliminated. The 5 P-K Type F Screws that now fasten curved blade to cast iron handle ended tapping. Power driving further speeds assembly.



with P-K quality–planned assembly savings pay off



HOOVER SMOOTHED OUT trouble and speeded assembly of this Steam or Dry Iron by switching to P-K Self-tapping Screws for seven fastenings previously made with machine screws. Tapping and lock washers were eliminated. The assembly is made stronger than ever, with an important saving in time. Five P-K Type F Screws fasten the phenol formaldehyde handle to the sole plate cover (left). On the assembly line, these screws are power driven. One P-K Type F Screw fastens the steam valve control support bracket to the die-cast aluminum filler tube at the front of the iron (not shown). One P-K Type A Screw fastens the heel closure plate to the terminal bracket (right).

The Original

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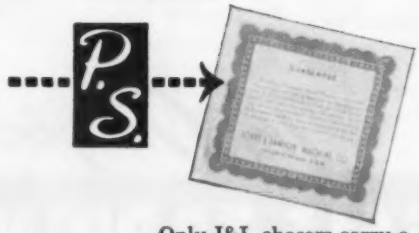

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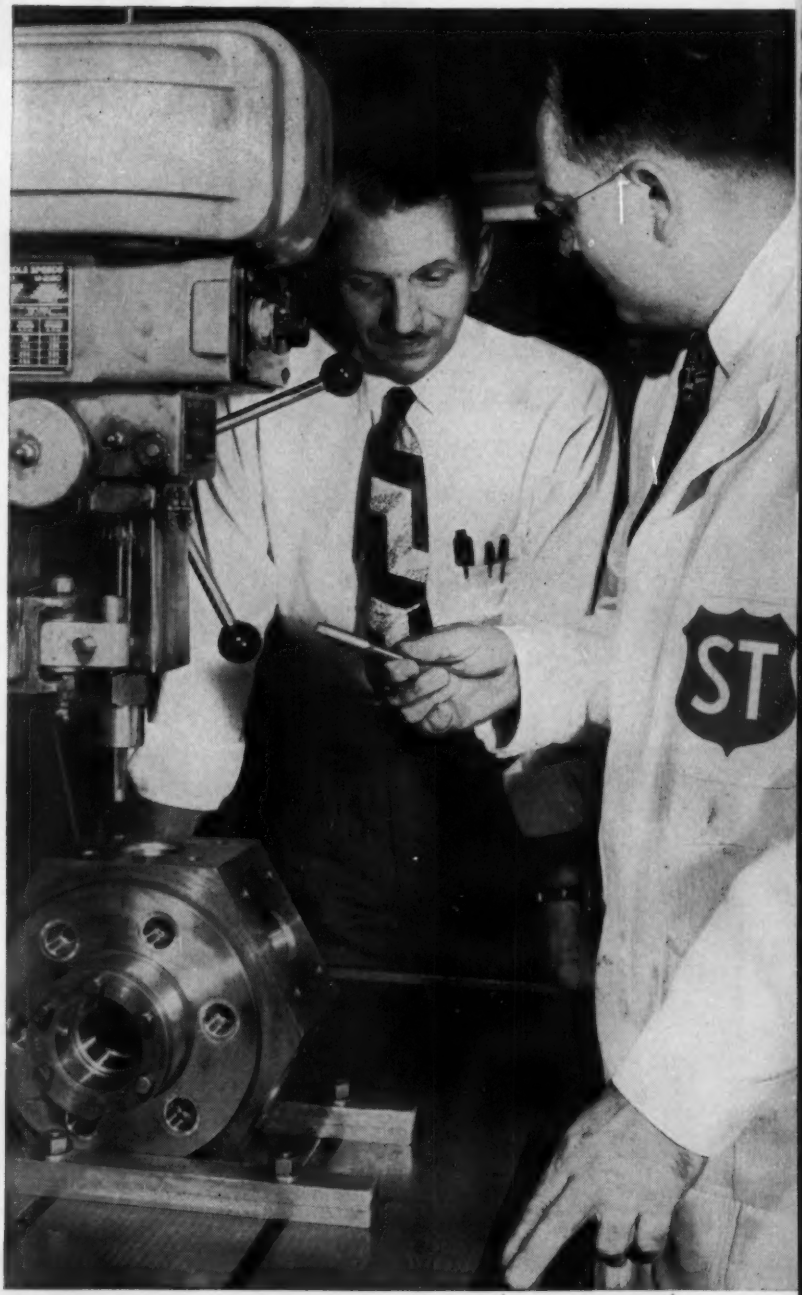

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• Large area, removable upper brackets.

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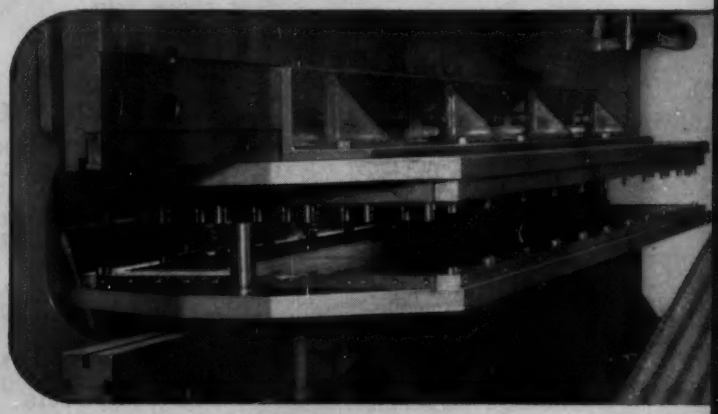
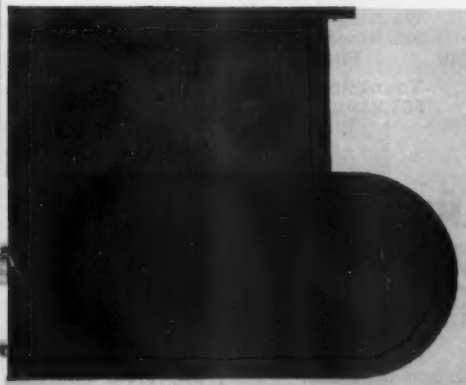


• Large area, removable upper and lower brackets.



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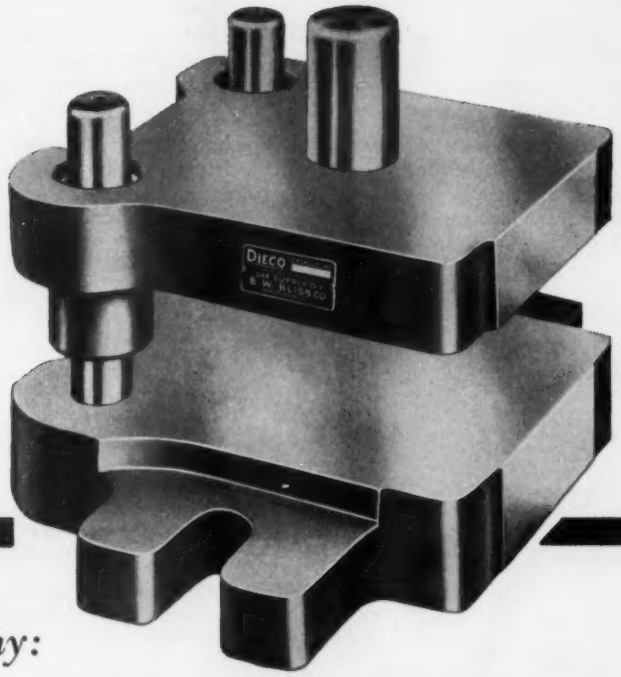

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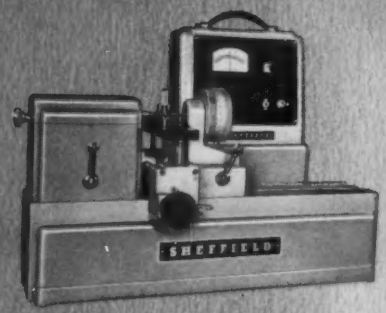
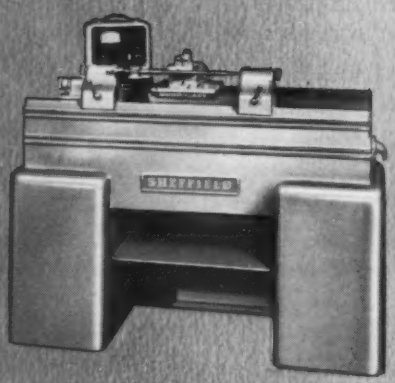


NEW HORIZONTAL EXTERNALCHEK: Dual amplification, 1000/2000 to one; capacity 12"; vertical table travel 2½"; micrometer tailstock with 1" adjustment.



UNMATCHED ELECTRONIC LEADCHEK: Dual amplification, 1000/2000 to one; scale range, .0015"; superprecision micrometer; work capacity 36" for length and 10" for diameter.

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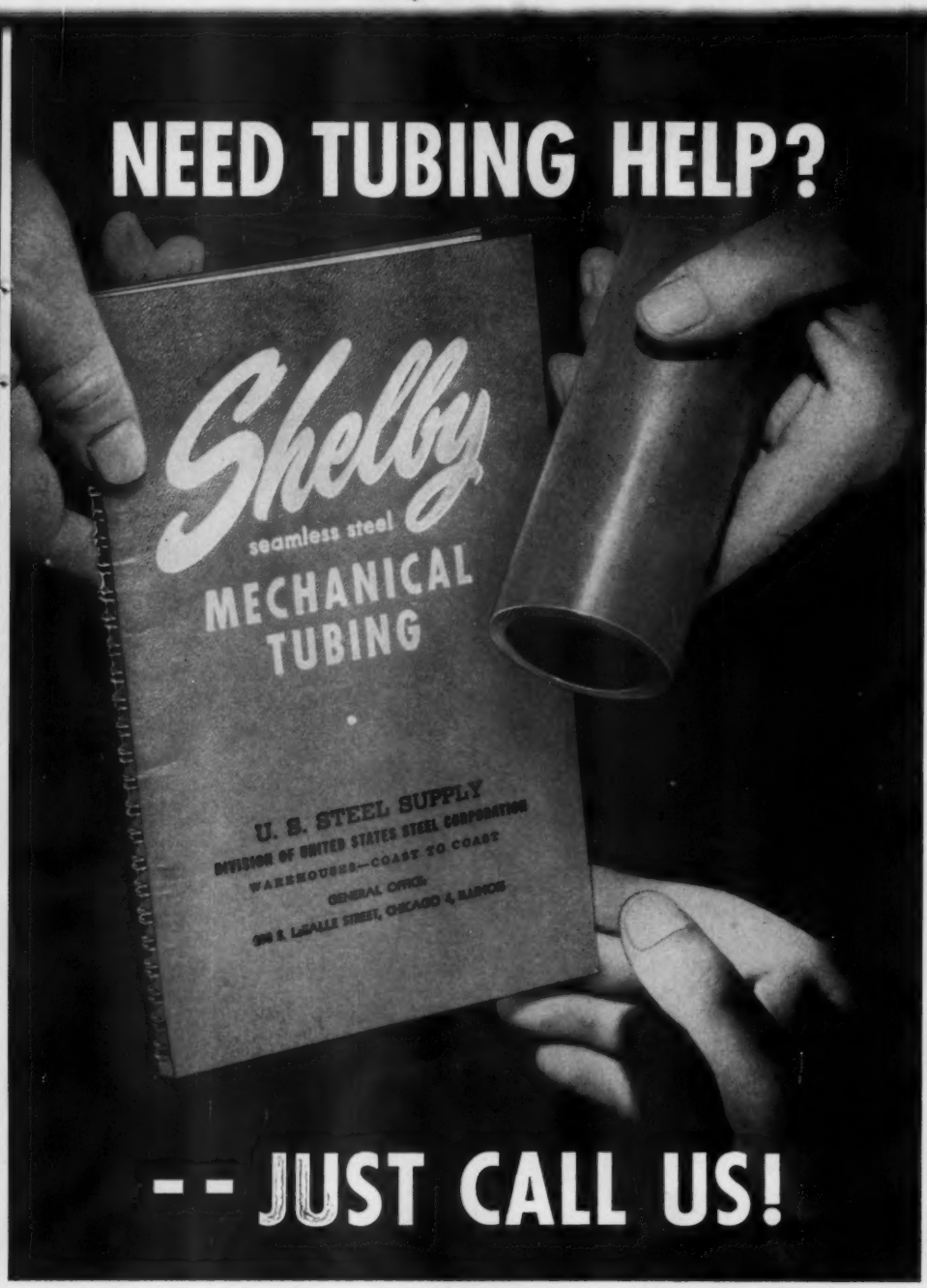

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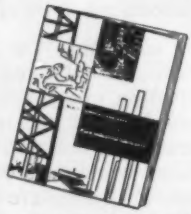

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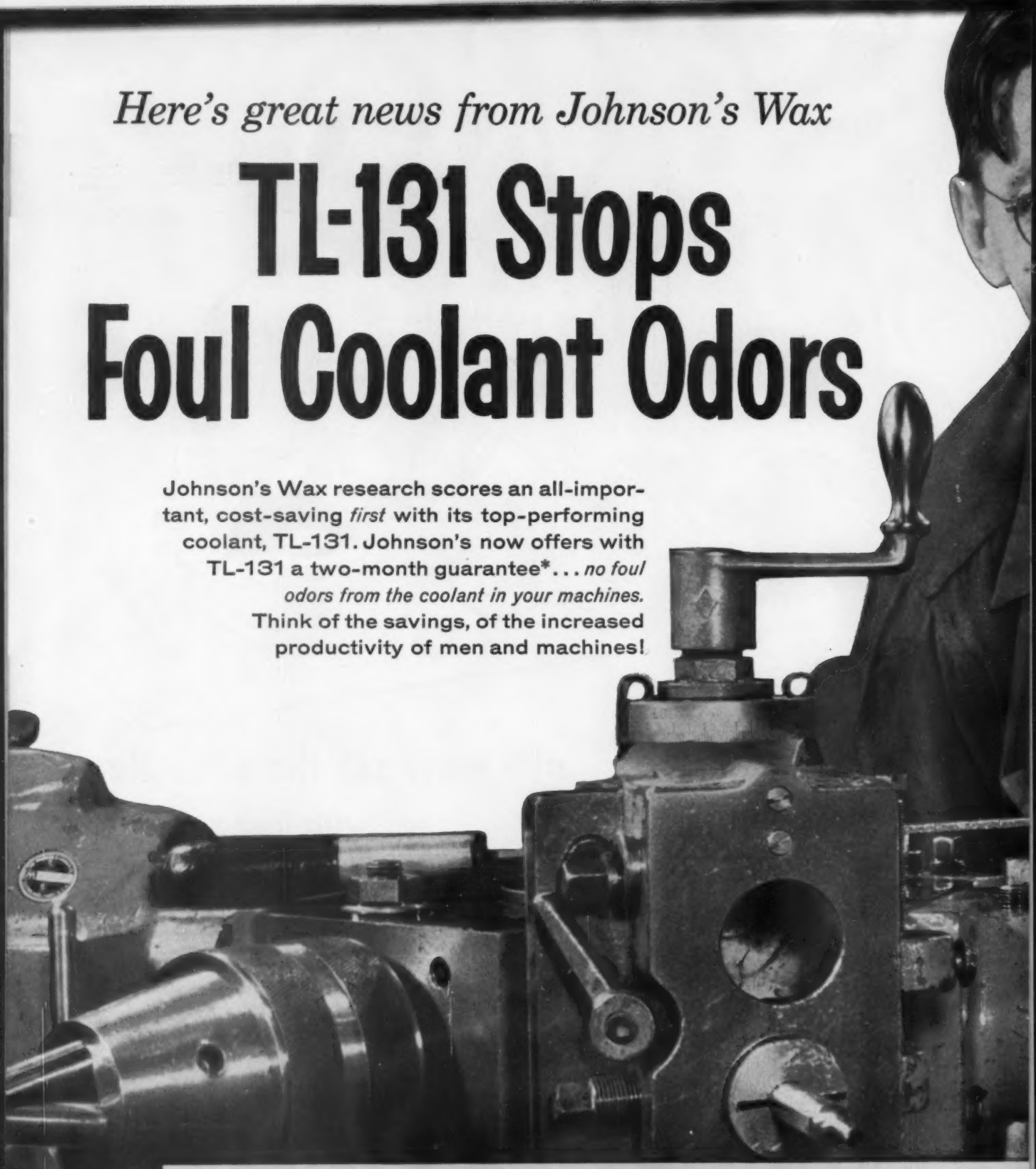
TL-131 Stops Foul Coolant Odors



Johnson's Wax research scores an all-important, cost-saving *first* with its top-performing coolant, TL-131. Johnson's now offers with TL-131 a two-month guarantee*... *no foul odors from the coolant in your machines.* Think of the savings, of the increased productivity of men and machines!

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There's hot, humid weather ahead, bringing with it the headaches of coolants that turn sour and create offensive odors. Combating coolant odors is time-consuming and costly . . . changing coolants every week or two . . . using irritating bactericides.

Now, Johnson's Wax announces that TL-131 is guaranteed to solve the problem of foul coolant odors. Simply clean your coolant system thoroughly, charge with fresh, clean TL-131 (economically diluted 40 to 1 with water), and we *guarantee* TL-131 will work efficiently for two full months without causing foul odors.

In addition, TL-131 consistently outperforms ordinary coolants to provide increased tool life and greater production. Remember, TL-131 is the coolant that reduces work heat by 400°F. See your local distributor for an in-the-shop test. Mail the coupon for full information.

Guaranteed performance

Mail this coupon today for FREE informative booklet on how to end foul coolant odors with TL-131.

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"How Norton makes the sparks fly!"

"When a plant's grinding operations break down, their production lines may grind to a halt, too. *We* have to make the sparks fly!" says Doug Dawson.

"The abrasive that can meet specifications – and *gets there first* – gets the order.

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"How? With on-the-ball engineering – and Air Express! To us, Air Express is like a full warehouse in every community; we can deliver anywhere in the U.S. in a few hours.

"Yet, we actually save money when we use Air Express instead of other air carriers. A typical 25-lb. shipment from Worcester to Chicago, for example, costs $8.85. That's $3.55 cheaper than any other direct air service!

"Those savings add up when you ship as much as 1,000 pounds a day by Air Express, as we do!"

Air Express

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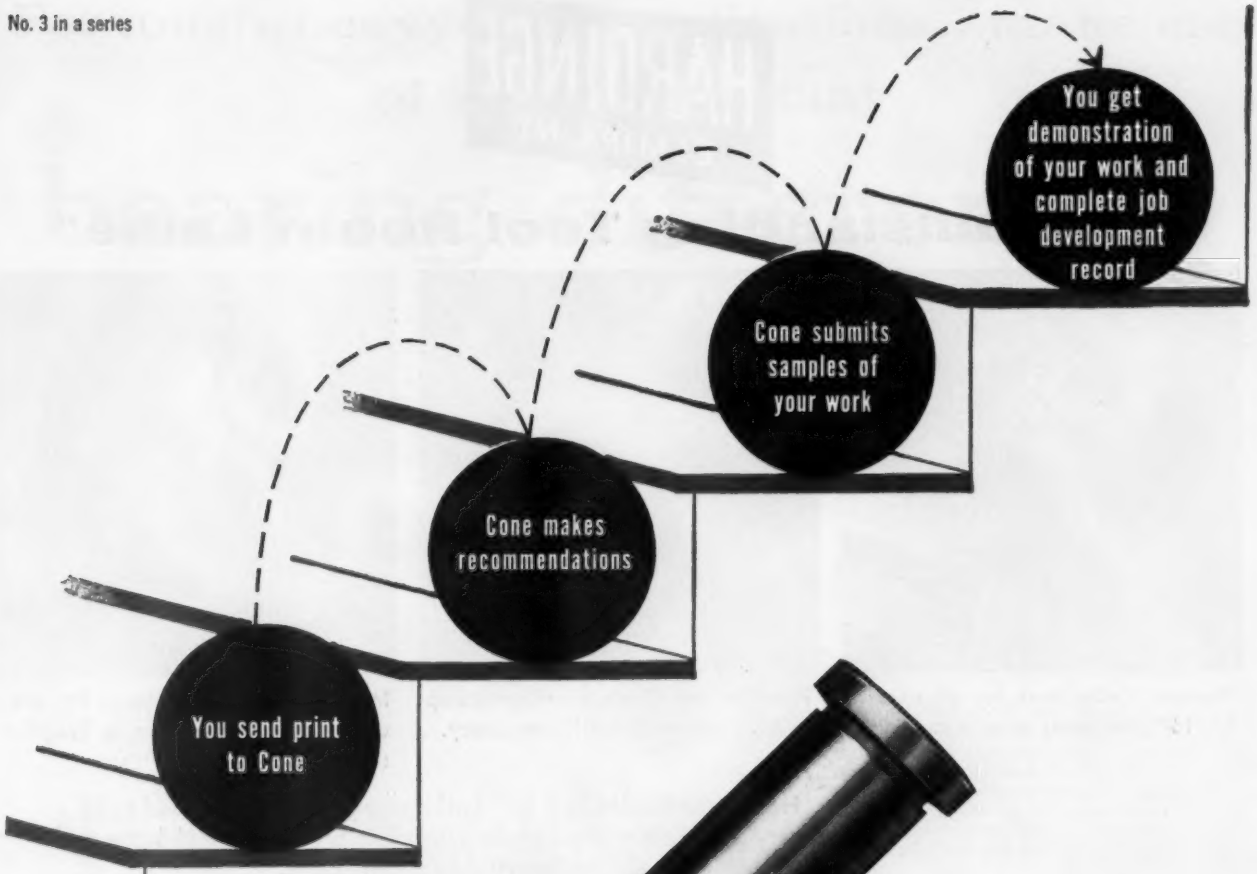
CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

No. 3 in a series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Machine	1⅜" Conomatic
Tools	100% Carbide Tipped
Material	C-1144
Stock Size	1¼"
Length	4 1/16" Cutoff 4½" Turn
RPM	1216
Time	17 Secs.

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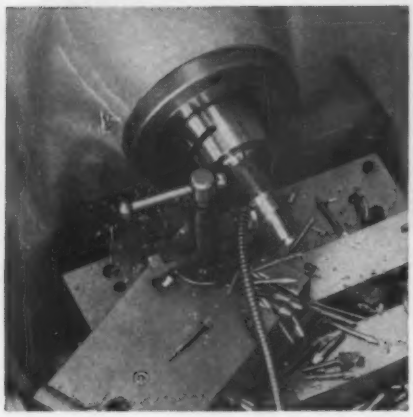
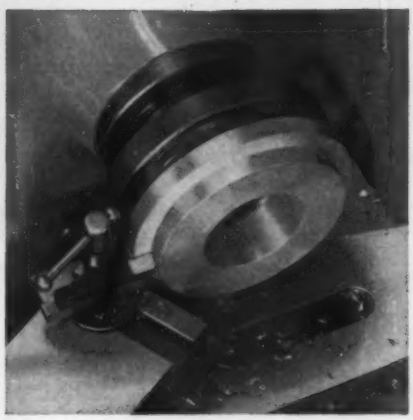
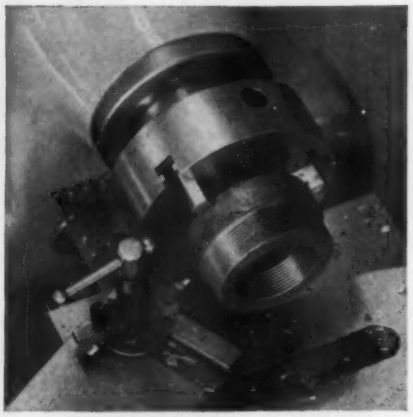
"The Outstanding Tool Room Lathe"



Precision Collet work for all sizes to 1-1/16"Collet seats *directly* in spindle.



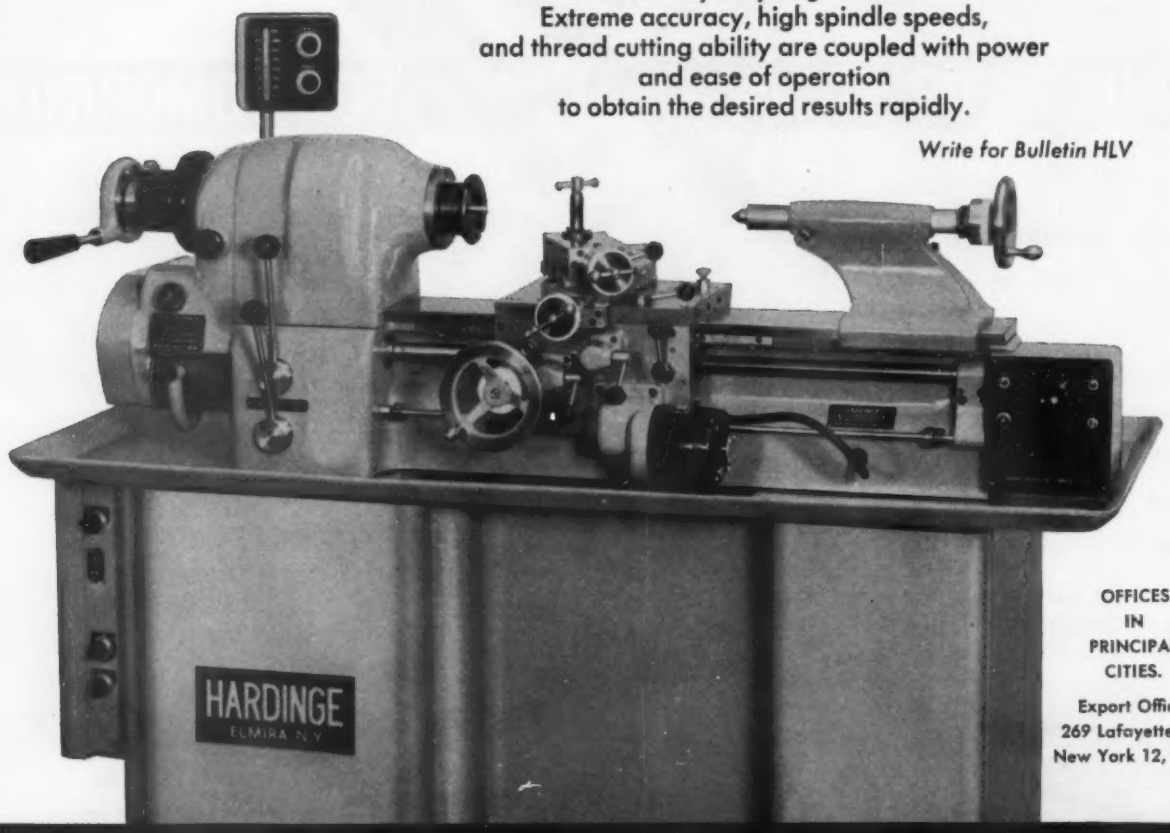
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

Write for Bulletin HLV



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Export Office:
269 Lafayette St.,
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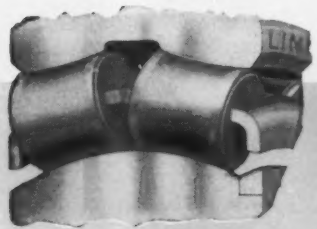
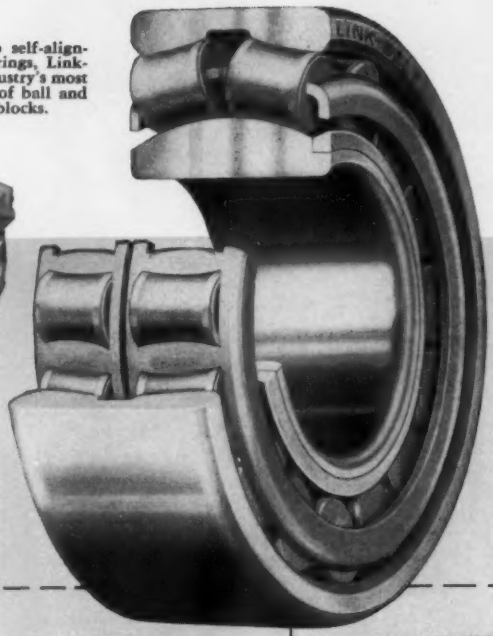
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

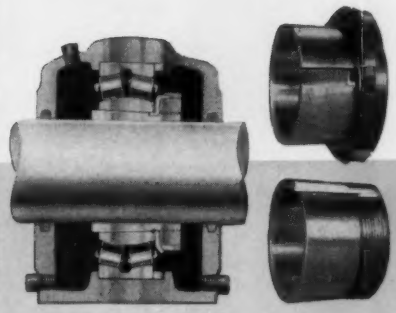
For tough, heavy-duty applications...make use of these important

bearing differences

In addition to self-aligning roller bearings, Link-Belt makes industry's most complete line of ball and roller bearing blocks.





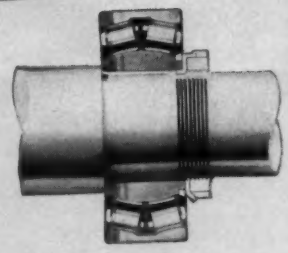


FREE ROLLING—SELF-ALIGNING. Rollers are naturally positioned by their concave shape. Design assures true rolling under all conditions. Spherical inner ring can be aligned in any direction without affecting load capacity.

EASY INSTALLATION and removal of adapter type bearings are provided by the tapered fit of bearing on adapter sleeve which is readily adaptable to commercial shafting tolerances. Locknut draws sleeve tightly around shaft for positive, concentric mounting. Lockwasher holds locknut in place.

LOCKED-IN CLEARANCE. Selective assembly of rollers and raceways with accurately formed hardened steel retainers assures proper operating clearance, guidance and spacing of rollers.

Rollers are completely pocketed in retainers for accurate spacing and guiding.



SMOOTH OPERATION, LONG LIFE are advantages of the straight bore type mounting, which assures maximum concentricity of inner ring with shaft. Especially desirable when minimum radial run-out is essential.

They're all present only in LINK-BELT self-aligning roller bearings

SUBTLE differences in bearings can make notable differences in the life and efficiency of your equipment. Take Link-Belt self-aligning roller bearings, for example. Their "self-contained" feature permits the bearing to float axially in the mounting, when desired, compensating for shaft expansion or settling of bearing supports . . . preventing extraneous thrust loads from being set up between bearings on the same shaft. What's more, inherent self-aligning design and preadjustment preclude use of expensive or cumbersome self-aligning housings.

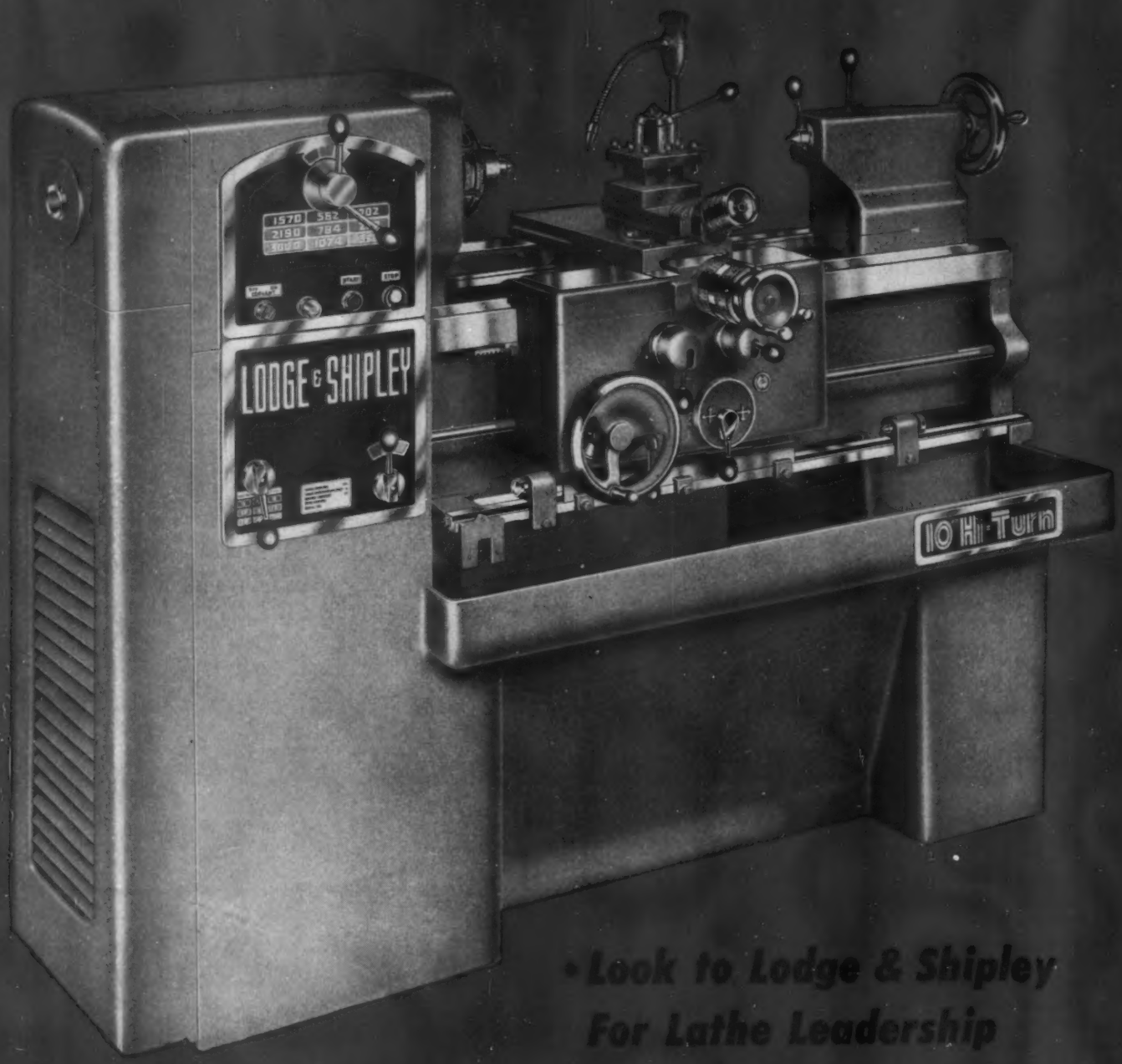
Ask your nearest Link-Belt office or authorized stock-carrying distributor for Book 2196 on self-aligning roller bearings and Book 2550, containing full data on all Link-Belt ball and roller bearings.

LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,711-A

NEW LODGE & SHIPLEY 10"



*Look to Lodge & Shipley
For Lathe Leadership*

SEE IT NOW! and *SEE IT* AT THE MACHINE TOOL SHOW, SEPTEMBER 6-17

Hi-Turn LATHE

A SMALL LATHE with FAMOUS LODGE & SHIPLEY QUALITY and ACCURACY

**FULL 5 H.P.
3000 R.P.M.
HEAVY DUTY
GEARED HEAD**

only
$4,985*

including electrical equipment, ammeter, direct reading cross feed dial, dial for apron handwheel, pan, pump and tubing, and other items.

The Lodge & Shipley 10" HI-TURN Lathe is a completely new concept in lathes . . . new in size, design, utility and even in price—offering far more productivity for the dollar. It provides high speed turning, boring and facing capacity for production departments, where the use of a leadscrew is of no consequence.

Over a period of years, Lodge & Shipley research with lathe users of every type, established the fact that lathes used on a production basis rarely require leadscrews. Tailoring the 10" HI-TURN exactly to production requirements, Lodge & Shipley has eliminated the leadscrew and all its complicated gearing. The result is a rugged lathe of high accuracy, efficiency and productive capacity at a price substantially lower than conventional lathes.

Put the money-making 10" HI-TURN to work in your plant now! Like all Lodge & Shipley equipment, it's available on new deferred payment and lease plans. *Write for Bulletin 300, The Lodge & Shipley Co., 3055 Colerain Avenue, Cincinnati 25, Ohio.*

NEVER BEFORE...SO MANY FEATURES... SO MUCH QUALITY AT SUCH LOW COST!

- Nine speeds up to 3000 RPM and 5 HP
- Built-in horsepower ammeter
- Color-coded speed and feed selection
- Totally-enclosed quick change gear box
- Dynamically braked motor in leg
- Template type, multiple length stops, magnetic clutch-operated
- 3 point floor mounting, requires no special foundation . . . easy to level
- Convenient, integral coolant system
- Chip pan effects easy chip removal
- Twist resistant elliptical girth bed
- Flame-hardened and ground replaceable steel bedways
- Hardened and ground cross slide ways
- Anti-friction bearings and trouble-free mechanized lubrication
- Direct reading cross and top slide dials
- 4-way tool block built into top slide
- Provision for rear tool block . . . multiple dovetail tool holders

Lodge & Shipley

your LODGE-*ical choice*

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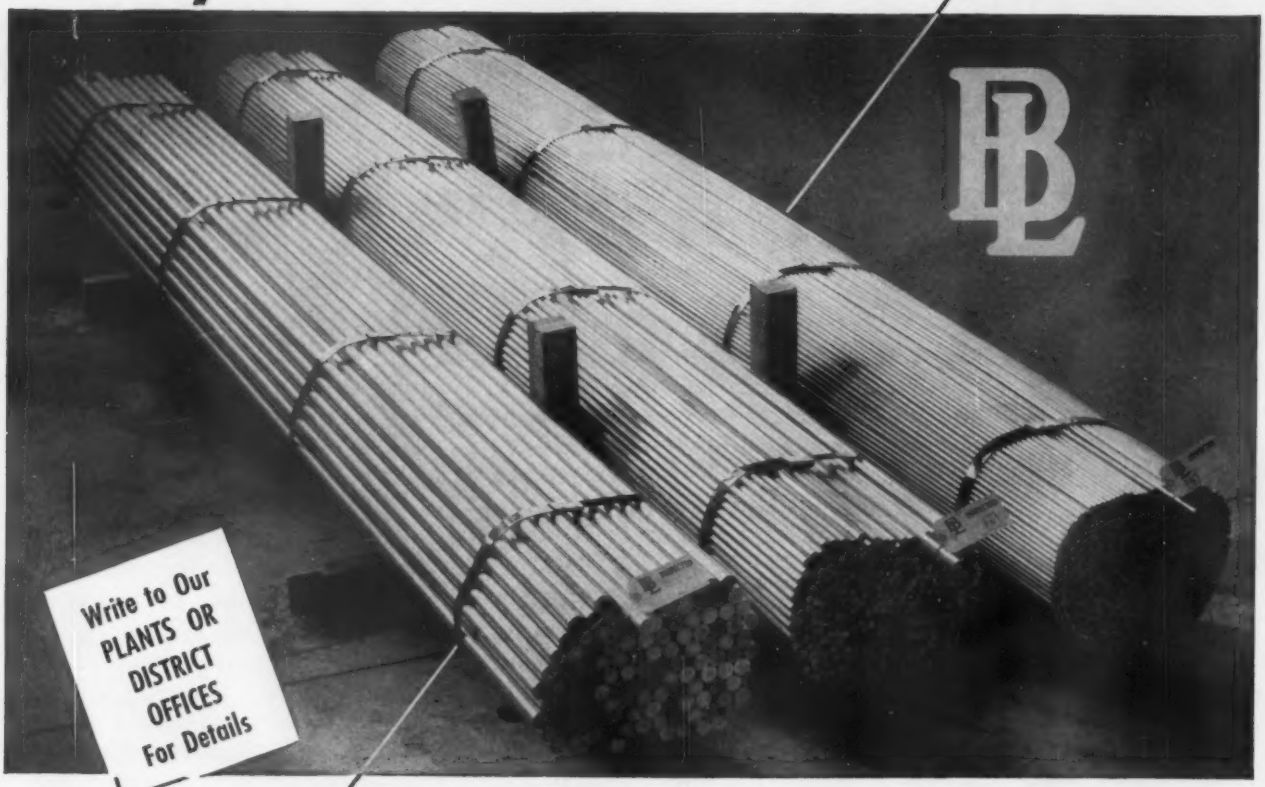
New Look and New Standard

for COLD DRAWN BAR FINISHES



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COLD DRAWN FINISH

Cold Finished Carbon and Alloy Steel Bars

*LUSTERIZED PROCESS Pat. Applied For

Buy it . . . Compare it!

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FOR YOUR DATA FILE....

a *NEW GUIDE* to SOLUBLE OIL SELECTION

Every industrial lubricant is measured by its performance. Water-mix cutting and grinding fluids are no exception... it still takes the *right* oil to do the *best* job!

Stuart Oil Company's guide on water-mix cutting and grinding fluids is intended as a help when you're selecting a water-mix for the shop. It provides information and background on water-mixtures that you should know.

"The Man in the Barrel," your Stuart Representative, will be pleased to provide further information and help when you're selecting a water-mix fluid. Send for your book today and ask to have "the Man in the Barrel" call, too.

DASCO

Two water-mixes built into one. Dasco Super Soluble Base is a heavy-duty water-mix cutting and grinding fluid of unusual versatility. Superior performance is provided in mixtures of 1-40 and higher for turning, milling, reaming, drilling and boring, and 1-100 and higher for grinding. Provides excellent stability and resistance to rancidity.

KLEENKUT

A *conventional* type soluble oil to perform such jobs as light milling, turning, drilling, boring and others. When used for those run-of-the-mine soluble jobs, Kleenkut provides something *extra* with more uniform performance, greater stability, improved detergency, better emulsibility and high anti-rust value.

SOLVOL

An emulsified heavy-duty cutting oil that is especially effective on the more severe applications where ordinary type soluble oils fall short of meeting tool life and finish requirements. Solvol provides a balance of cooling and lubricating value rarely equalled in a water-mix product.

CODOL

Stuart's water-mix liquid grinding compound that has been specially designed to reduce wheel loading. It provides adequate heat dissipation, anti-rust protection and a carefully balanced surface tension to carry away chips and abrasive particles. Codol is Stuart's step *beyond* conventional water-mix grinding fluids.

More than a "Coolant" is Needed

D. A. Stuart Oil Co.
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TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

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Please send me a copy of Stuart's Water-Mix Cutting and Grinding Fluids book.

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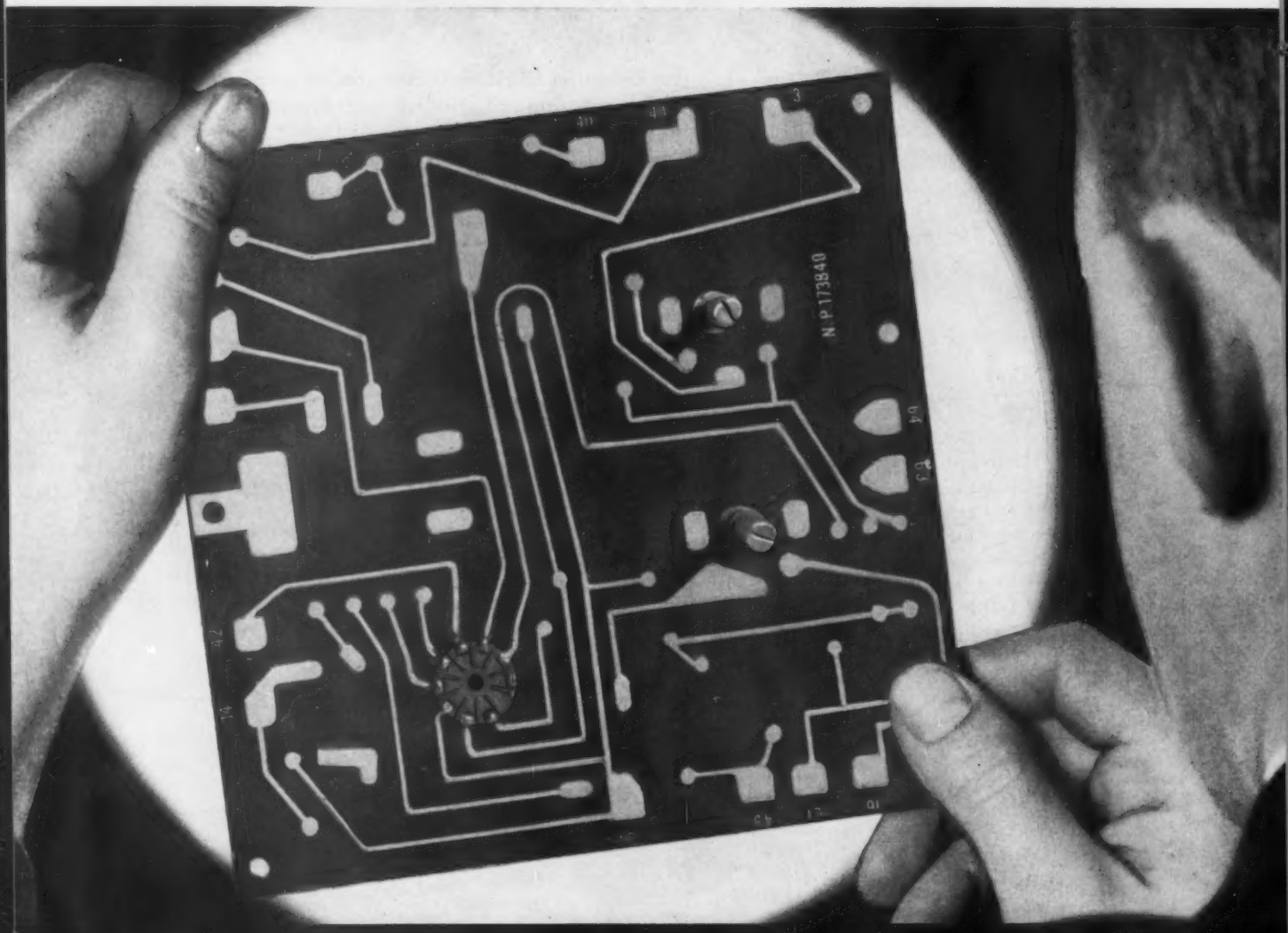
☐ **Please have "the Man in the Barrel" call.**

GENERAL ELECTRIC ANNOUNCES . . .

NEW, Low-price Thy-mo-trol*



Printed Circuits—or "wireless" circuitry—constitute the "brains" of the new general purpose Thy-mo-trol Drives. Simply, it is a method of printing an electrical diagram on the back of a sturdy, lightweight plastic board. The electrical "track" or diagram is made of solder-covered copper strips.

All circuit components within the "brain" are connected without the use of wiring! A protective coating is sprayed over the entire printed circuit. All connections to the control circuits are of the simple "plug-in" type, making attachment and removal of connecting circuits a simple, hand operation.

"Brain" of new Thy-mo-trol Drive—printed control circuits. Top photo shows printed electrical diagram. G.E.'s industrial adaptation of this process helps reduce size and complexity of circuits. In lower photo, new at left, conventional at right.

Drive with Printed Control Circuits

NOW! GET RELIABLE, SMOOTH, ADJUSTABLE SPEED FOR MACHINE TOOLS IN A SIMPLIFIED, LOW-PRICED DESIGN

Designed for quality performance, reliable operation, easy maintenance, and at a new low price, a new and simplified line of general purpose Thy-mo-trol Drives has been developed by General Electric. These drives represent a new and far-reaching step in electronic adjustable speed.

An approximate 20% price reduction under the line it replaces is possible because G-E has successfully simplified the entire control system and has adapted printed control circuits into the Thy-mo-trol panels. New Thy-mo-trol design allows a substantial reduction in *weight, size, circuit complexity, wiring, maintenance costs and installation cost.* The new design is now available in two ratings: ¾ to 1 hp and 1½ to 3 hp—making your choice of an adjustable speed drive to meet specific needs that much easier.

Operating directly from a-c power, the new standard Thy-mo-trol Drive includes an electronic control panel, a d-c motor, and a push-button station. No anode transformer is necessary if operated on 440 volts, 50 or 60 cycle, single phase power. Separately mounted auto-transformers are supplied as a standard feature for voltages other than 440.

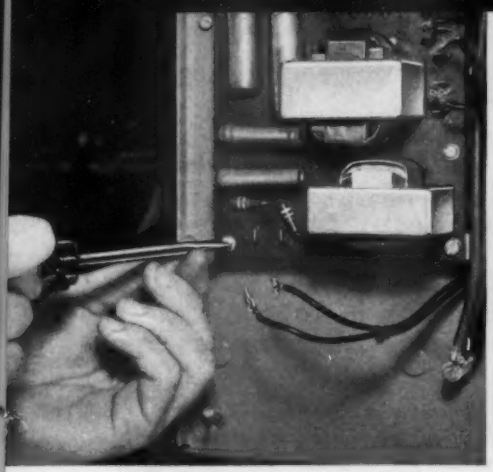
The new drive is rated at constant torque over the entire speed range. Speed range is 8 to 1 for continuous duty with higher ranges possible for special applications. Optional modifications include jogging, reversing, tachometer feedback, reactor loop control, and external current limit adjustment.

For more information on this outstanding new adjustable speed drive, contact your nearest G-E Apparatus Sales Office or write for Bulletin GEA-6234, General Electric Company, Section 791-1, Schenectady 5, New York.

Progress Is Our Most Important Product

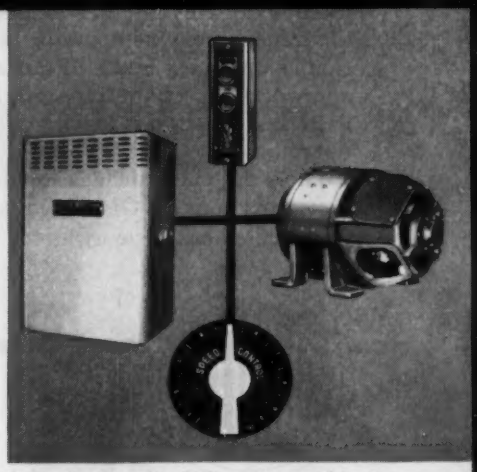
GENERAL ELECTRIC

*Registered Trade-mark of General Electric Company



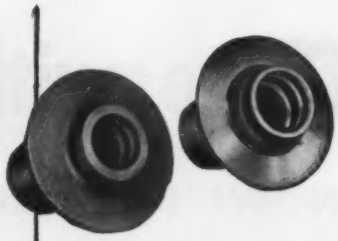
Easily attached or removed. Only a screwdriver is needed. Plugs and terminals are numbered for easier service.

Simplified repair. Component replacement is fast and easy—a simple bench operation. No need to discard entire unit.

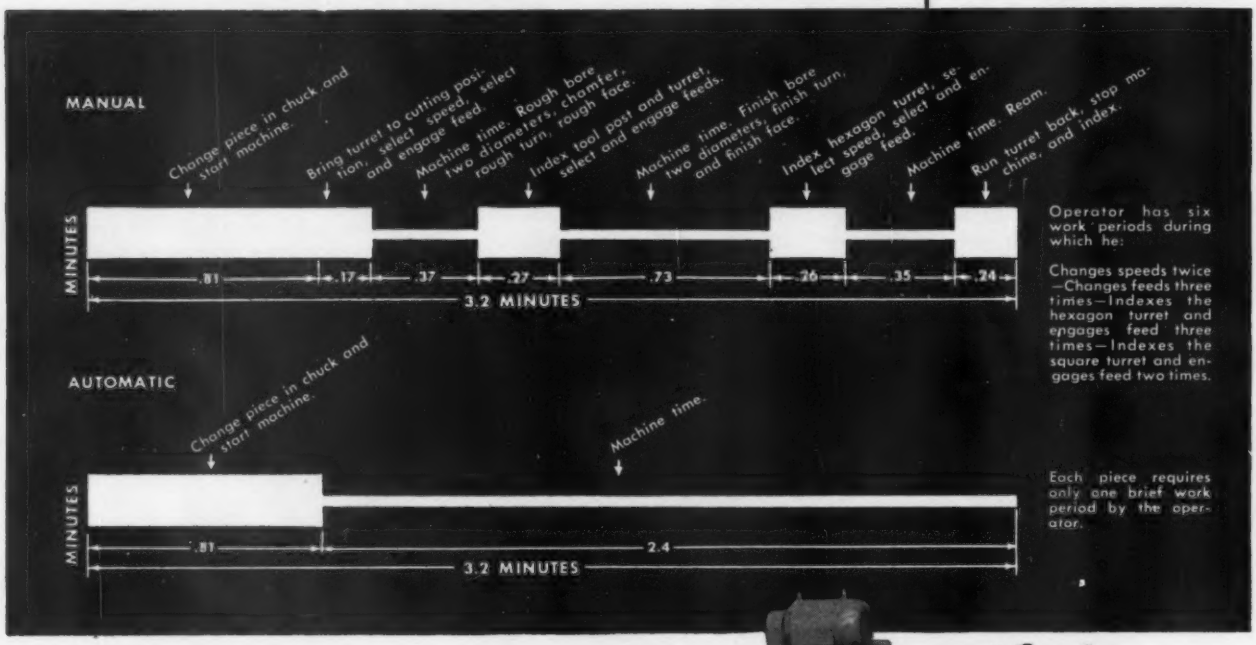


Three basic units. DC motor, pushbutton station, and panel containing tubes and "brain" make up new Thy-mo-trol Drive.

how the GISHOLT FASTERMATIC saves man-minutes and money!



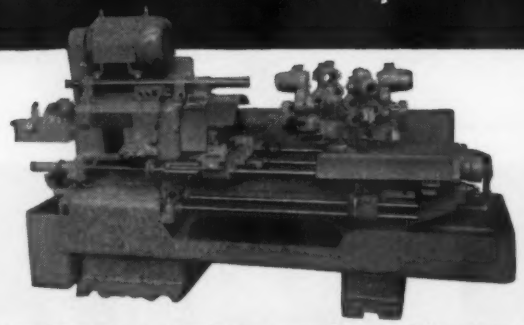
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position, select speed, and engage feed, select
Machine time. Rough bore two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn, and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice —Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

WESTERN UNION TELEGRAM

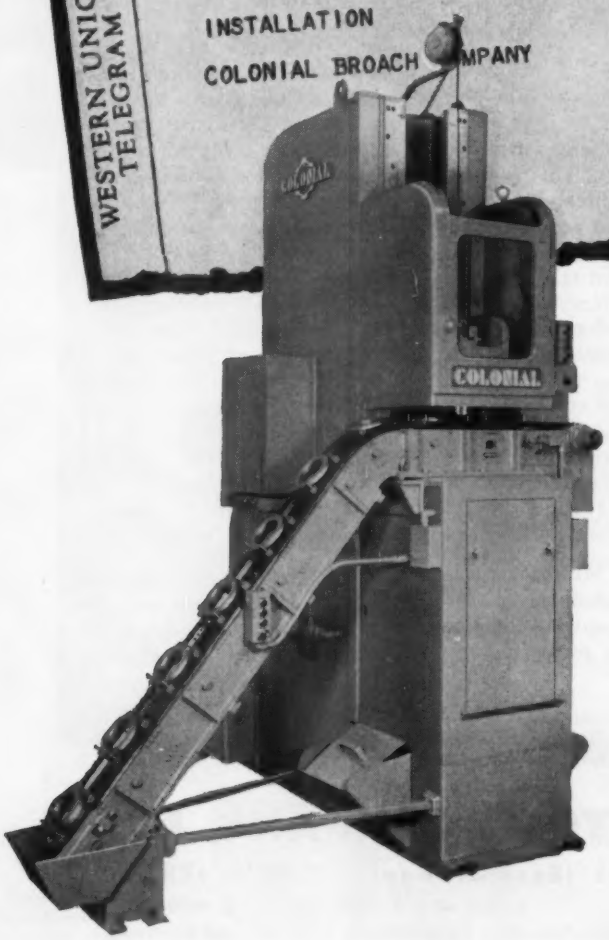
WESTERN UNION TELEGRAM

WESTERN UNION TELEGRAM

CMC 6 WUX MARCH 9 1955 2:05PM

EVERY 12 SECONDS INSIDE DIAMETER ON A DIFFERENTIAL RING GEAR IS BROACHED TO CLOSE LIMITS ON THIS AUTOMATED SETUP 100 PER CENT EFFICIENCY GIVES A PRODUCTION OF 300 PER HOUR OPERATOR LOADS CONVEYOR FROM FLOOR WITH FOUR STATIONS IN EASY REACH GRAVITY UNLOADS BROACHED RING GEAR BLANKS REPEATING 12 SECOND CYCLE IS (1) PULL-UP WORK STROKE (2) INDEX TO RETURN POSITION (3) RETURN STROKE (4) INDEX TO BROACHING POSITION CONTROLS ARE COMPLETELY SAFETY INTERLOCKED REQUEST BULLETIN RU-54 FOR SPECIFICATIONS ON STANDARD 15-TON 48-INCH STROKE COLONIAL PULL-UP MACHINE IN THIS UNIFIED BROACHING INSTALLATION

COLONIAL BROACH COMPANY



every 12 seconds!

PIONEERS OF H.S.S. BROACHING

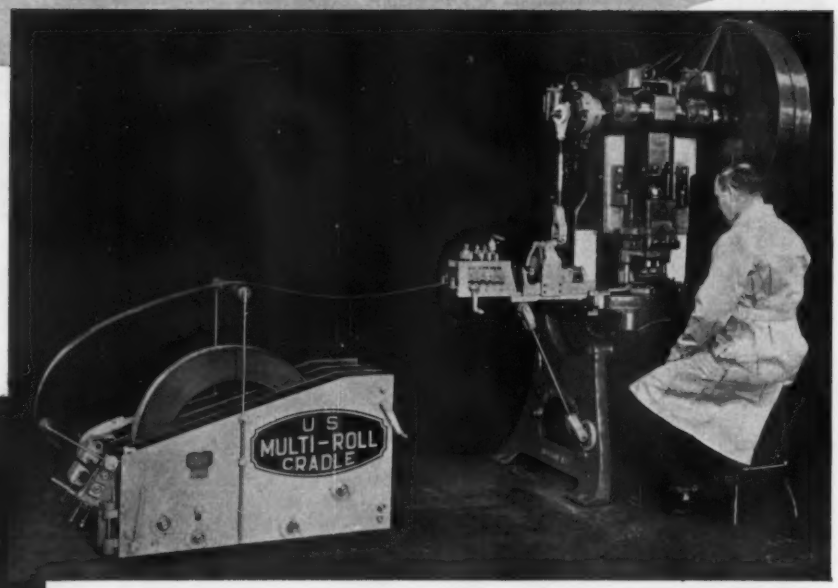
COLONIAL

BROACH CO. DETROIT 13

UNIFIED BROACHING is the key to successful broaching

For maximum press room efficiency . . . For controlled unwinding of all types of stock in coils . . .

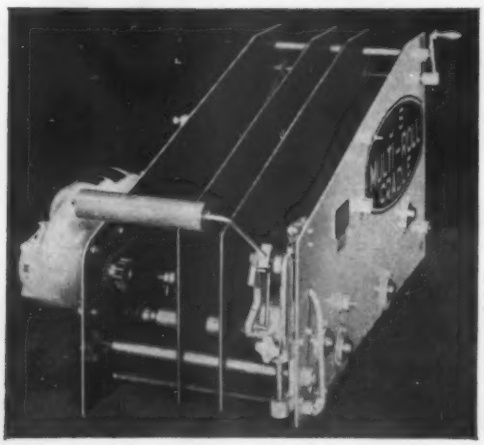
THE U. S. MULTI-ROLL CRADLE



U. S. Multi-Roll Cradle Model ACC-1-9C, with four power-driven rest rolls plus a pair of power-driven take-out rolls. A geared motor of 1/3 H.P., 155 R.P.M. gives output speeds up to 80 feet per minute. For special applications other motors can be provided. The cradle will handle stock up to ⅛ inch in thickness, 9 inches in width, and coils with OD up to 40 inches. Photo shows Multi-Roll Cradle set up with a U. S. Stock Straightener and a U. S. Slide Feed to make the press completely automatic.

Above: In the smaller sizes, coils of stock can be easily rolled into the cradle by one man. During the loading the take-out roll assembly is released by a trigger latch and swung to the side. It snaps securely into place when swung back into operating position.

Below: Model ACC-1-9NT with four power-driven rest rolls only. This unit is designed so that power-driven take-out rolls can be added at any time.



With the U. S. Multi-Roll Cradle you can get the fullest benefits from the inherent advantages of using stock in coils. It has been designed to enhance press performance by unwinding stock in a steady, smooth run under complete control at all times. This is accomplished with four power-driven coil rest rollers mounted in self-aligning bearings and arranged in an arc to equalize weight distribution. In addition, on Model ACC-1-9C further power is provided by a pair of power-driven take-out rolls to completely unwind coils which have a tendency to sag or slip when rest rolls only are used. Both sets of rolls are actuated by a loop control arm which operates through a micro switch. The stock can pass over the roll or press against it; either way, the feed to the press is positive and constant and can be adjusted to rates up to 80 feet per minute. When handling some types of coils the power-driven take-out rolls may not be required and the cradle can be purchased with the four power-driven coil rest rolls only (Model ACC-1-9NT). On this unit the power-driven take-out rolls can be easily added later if needed.

The U. S. Multi-Roll Cradle is also designed for easy and rapid coil loading, and the compactness of the frame and the controlled unwinding feature make it possible to set it up close to the press for most economical and safe use of floor space.

Get full details and specifications of the U. S. Multi-Roll cradle in special bulletin 90-A. Write for your copy today.

U.S. TOOL COMPANY, Inc.

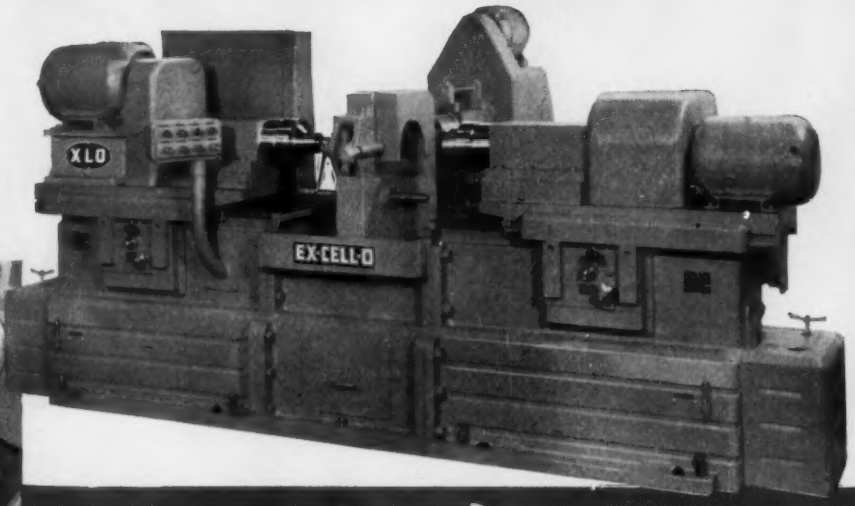
AMPERE (East Orange) NEW JERSEY

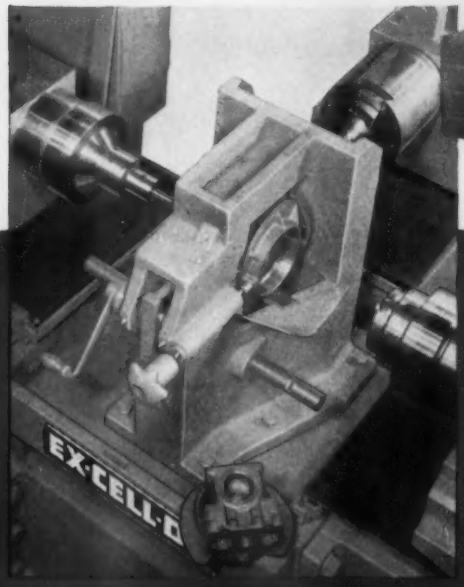
Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Ex-Cell-O 3-Way Precision Boring Machine. Standard way units—tooled to suit the work.

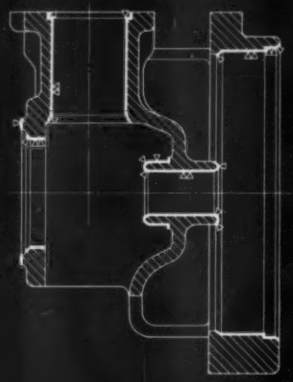
Note the simplicity of this tooling.





Cut Costs—Combine Operations

. . . INSURE YOUR PROFITS in Today's Competitive Market



Heavy lines show the machined surfaces. Small single triangles indicate single operations; double triangles indicate rough-and-finish operations.

Once a part is properly located and clamped, it's good practice to do as much machining on it as possible before it's moved! Related dimensions are held closer, handling time minimized and production increased.

This Ex-Cell-O 3-Way Precision Boring Machine performs 5 roughing and 18 finishing operations on a cast-iron crankcase used in the refrigeration industry. Tolerances are extremely close on the crankshaft and cylinder bores. Net production for the roughing operation is 33 parts per hour; for finishing, 36 parts per hour.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines—or write today for Bulletin.

XLO
EX-CELL-O *for* PRECISION

THE MACHINE TOOL SHOW
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SEPT. 9-17, 1955
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EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

NOW

a high-speed Quenching Oil that gives all-purpose performance

Here's why metal-working plants everywhere are changing to Shell Voluta Oil 23

1. **High cooling rate through the critical temperature range.** To develop maximum physical properties, various carbon and low alloy steels require higher cooling rates than provided by conventional mineral type quenching oils. Shell Voluta Oil 23, because of its initial cooling rate, helps develop these desired properties in such steels.

2. **Versatility of Use.** Shell Voluta Oil 23, because of its high cooling rate, helps to obtain uniform properties with any steel of variable hardenability. It works equally well at normal (120-150°F) oil temperatures and in hot-quenching operations with oil up to 250°F.

Quenching from cyanide into Shell Voluta Oil 23 gives exceptionally clean part surfaces . . . often eliminates the need for after-quench cleaning.

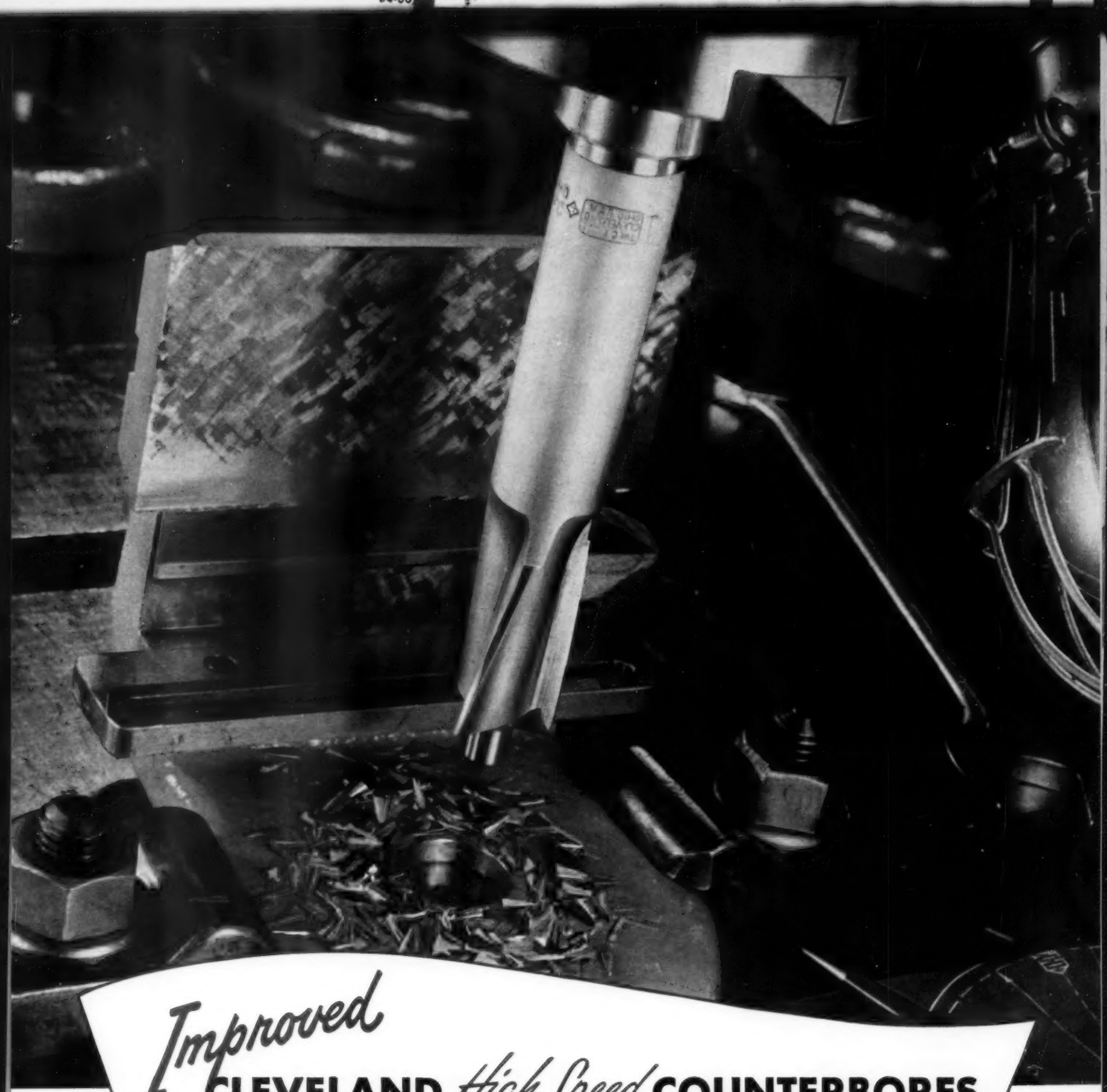
The cooling rate of Shell Voluta Oil 23 is high through the critical range, while its rate of cooling during martensitic transformation is essentially that of conventional oil. This combination is ideal for minimizing distortion tendencies.

3. **Stability in Service.** Extreme resistance to sludging and viscosity change has been achieved through the careful selection of well-refined base stocks and the use of special additives. Shell Voluta Oil 23 stays the same physically AND retains its high cooling rate. *Write for further details.*

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL



Improved CLEVELAND *High Speed* COUNTERBORES

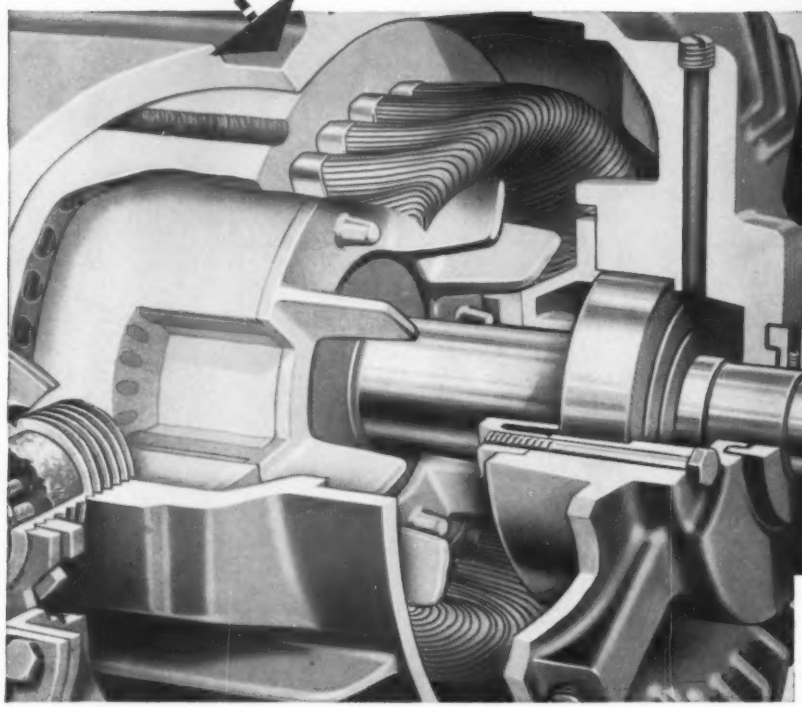
New Flute Design for More Efficient Chip Removal

Deeper flutes eliminate "packing" of chips and reduce tool breakage . . . enable you to counterbore the full length of the flutes. This *superior tool* also gives you the *economy* of interchangeable pilots. It requires no holders or adapters. ◈ A test will prove the outstanding features of these improved CLEVELAND Counterbores.

THE **CLEVELAND** TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

Get Both
bearing features

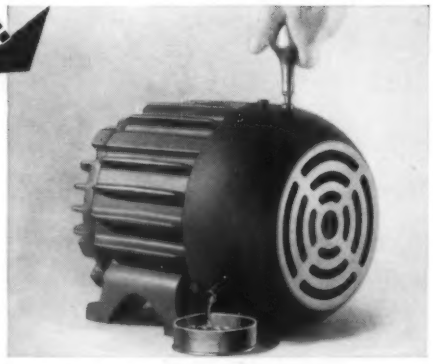


fully enclosed and protected

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

. . . yet easy to grease



You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at three points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7225.

A-4609

ALLIS-CHALMERS

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed Shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U. S. A.

New York and San Francisco

Write for Catalog.

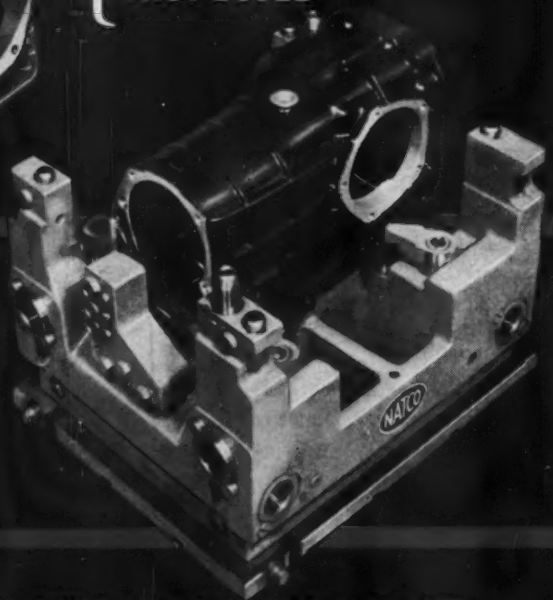
MORE TRANSMISSION CASES AT LESS COST.....

55 PARTS per HOUR

201 OPERATIONS ON EACH PART

DRILLED, BORED, REAMED, TAPPED, SPOTFACED, CROSS-FACED, MILLED, CHAMFERED and INSPECTED

Parts are loaded into individual holding units which are conveyed through the machine automatically. After machining is completed, chips are removed and the holding units pass through a washer and are returned to the first station.



for answers to your Drilling, Boring, Facing and Tapping problems

Call a Natco Field Engineer

CHICAGO, *Room 203, 6429 W. North Ave., Oak Park*
DETROIT, *10138 W. McNichols Rd.*
BUFFALO, *1807 Elmwood Ave.*
NEW YORK, *35 Beechwood Ave., Mount Vernon*

..... WITH A NEW NATCO HOLEWAY

BECOME OR REMAIN COMPETITIVE THROUGH MODERNIZATION

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

...Competitize with NATCO production!

NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA

NATCO

THE NEW **TUMICO**

Optic Vernier

HEIGHT GAGE

READ 1/1000th EASILY
Machine divided and etched glass horizontal-reading scale and vernier reads instantly in normal room light. No neck twisting to read scale. Eliminates all need for flash lights, magnifying glasses and auxiliary lights. Parabolic chrome reflector *behind* scale reflects diffused light and shows large scale and vernier figures in sharp relief assuring 100% accuracy up to 1/1000th.

ADJUST IN 5 SECONDS
Single push button frees jaw for initial adjustment. Convenient knobs, located on base and on top of gage post, provide fine 100 to 1 ratio adjustment of full length drive. Lock knobs on either side of jaw provide for quarter turn solid locking of jaw to beam.

H-BEAM RIGIDITY
Skyscraper type H-Beam provides stiff rigidity in all directions to maintain accuracy while making measurements. Heavy, lapped bottom base assures equal stability in all directions.

2.450" VERNIER
Use of large vernier, approximately 4 times larger than standard, not only reads instantly and clearly but eliminates practically all possibility of misreading and error.

18" TO 84" SIZES
Current schedules provide for the production of Tumico Optic Vernier Height Gage in 18", 24", 36", 48", 60", 72" and 84" sizes.

TUBULAR MICROMETER CO.
St. James, Minnesota

Gentlemen:

Please send full specifications and prices of your new Optic Vernier Height Gage.

We are particularly interested in the sizes checked:
18", 24", 36", 48", 60", 72" and 84".

Name_____

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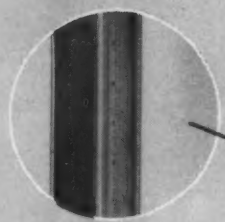
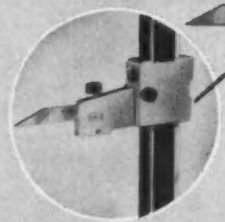
City_____ Zone____ State_____

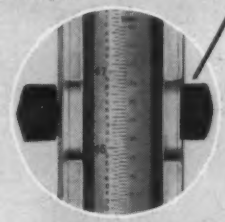
SAVES EYES
SAVES TIME
SAVES MONEY
SAVES MATERIAL



H-BEAM CONSTRUCTION
Absolutely rigid. Provides for full length actuating screw. Strong and stiff. All surfaces chrome plate or baked enamel.

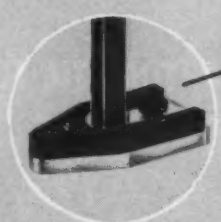


SCRIBER CLAMP
Attached to jaw, cannot fall off. Wide clamping range. Clamps all types of scribers above and below jaw.

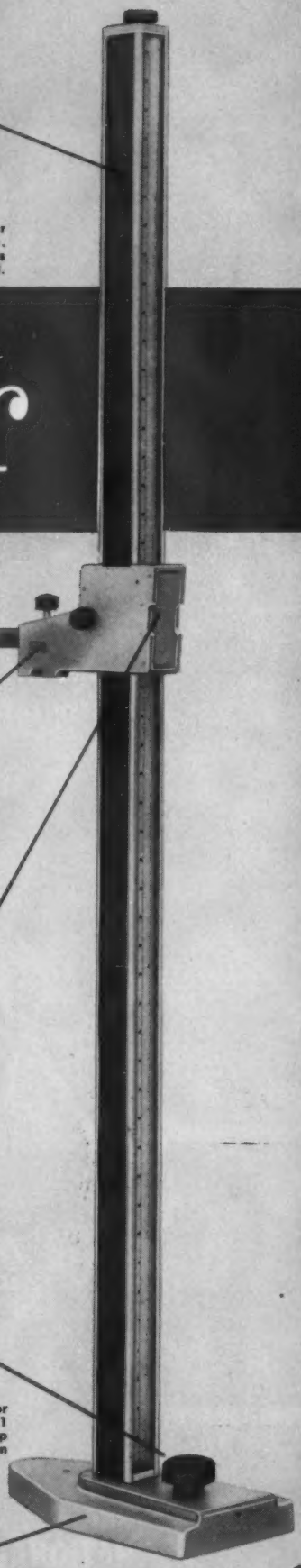


LARGE CLEAR VERNIER
Positive, accurate reading. Reads instantly in any normal light.

KNOB CONTROLS
Large diameter bottom knob for sensitive control of 100 to 1 ratio for final adjustment. Top knob control also provided on 48" gages and larger.



STABLE BASE
Gives uniform resistance to tipping. Optional base weights available for additional stability.



Morgan Engineering Co. now gets full efficiency from high-speed planer as...

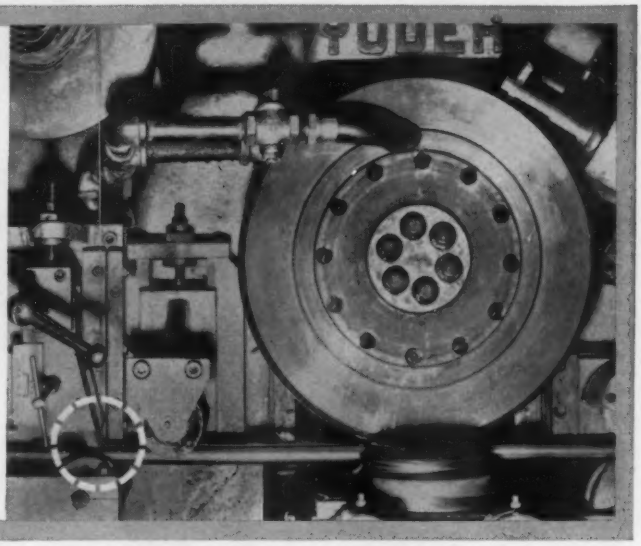
Carboloy Grade 370 carbide cuts production time 50% on steel-cutting "problem" job

Here's still more proof that there are no known "equivalent grades" for Carboloy® Series 300 carbides for medium- and heavy-duty steel-cutting:

PLANING CAST STEEL GEAR CASE. Long planer cuts on this 1-ton cast steel gear case cause thermal cracking in any carbide. Former tools had to be "babied along" to prevent excessive downtime for tool changes. Switching to Carboloy Grade 370, Morgan Engineering Co. now runs their high-speed planer four times faster . . . removing nearly 2000 cubic inches of metal before regrinding to eliminate thermal cracks. Production and tool life are doubled; machine efficiency is up 15%.

SETUP: Material—1-ton cast steel forging. **Speed**—160-180 SFPM. **Feed**—0.040-0.080 inch. **Depth of cut**—$\frac{5}{16}$-$\frac{1}{2}$ inch. **Coolant**—No.

Carboloy Grades 350 and 370 increase machine output, lower tool costs. Here's the complete story . . .

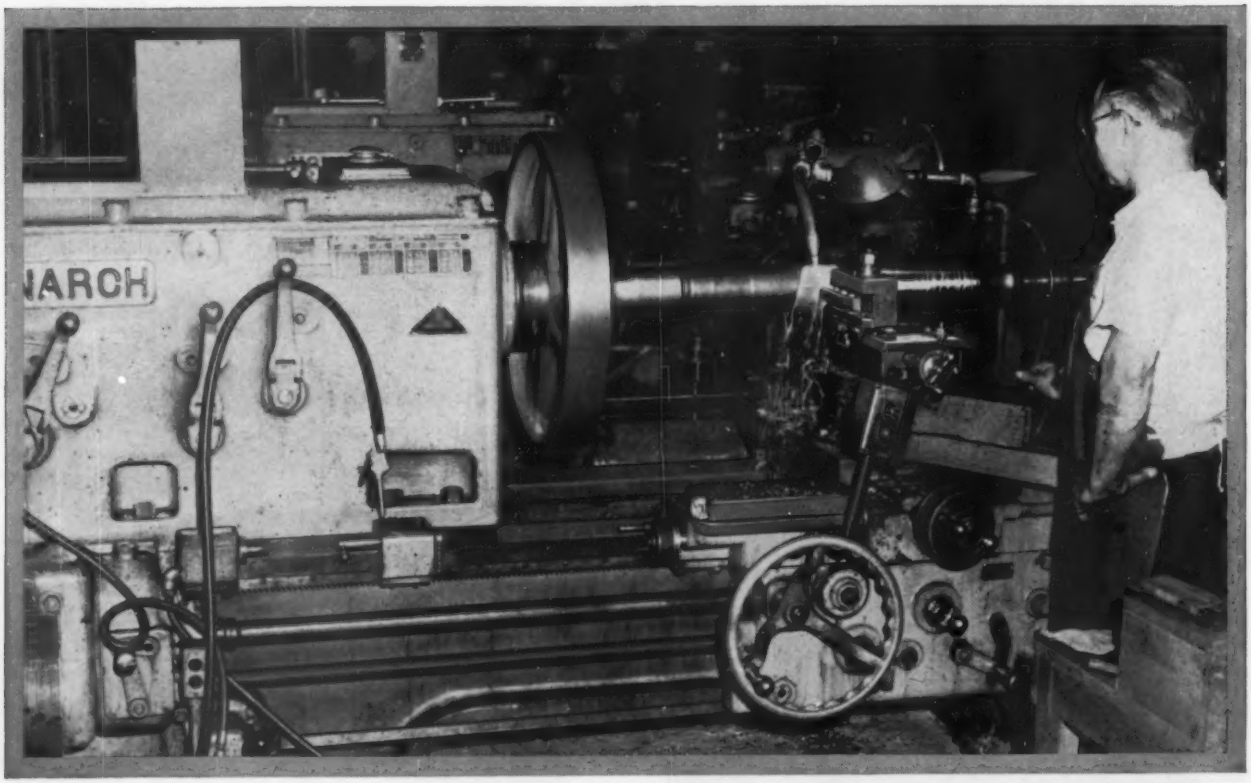


FLASH TRIMMING steel tubing at 2400°F ruined tools quickly at Bissell Carpet Sweeper Co., Grand Rapids, Mich. Switching to a standard Grade 370 tool eliminated costly special carbide tool; boosted production 14%. Line now operates full day without tool change.

SETUP: Material—cold-rolled steel. **Speed**—50-60 SFPM. **Coolant**—No.

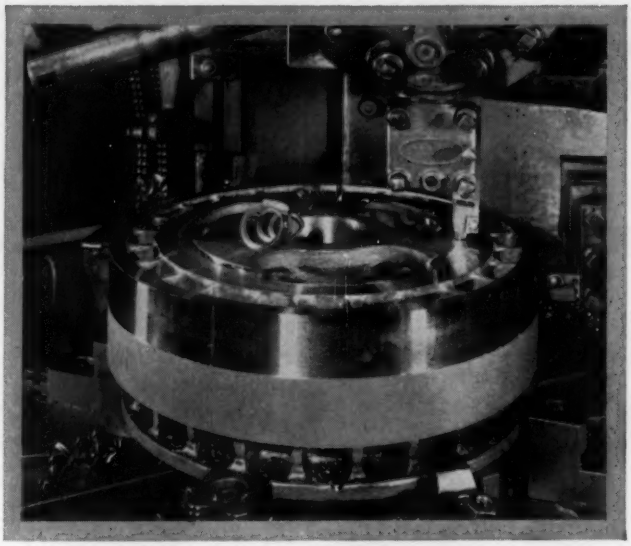
Case histories prove there are no known "equivalent grades"—

Carboloy 350 and 370 outperform



TURNING landing-gear piston with Grade 350 saved Menasco Mfg. Co., Burbank, Calif., ½ hour per shift in downtime. Other carbides produced 2 parts per grind at 125 SFPM; Grade 350 cuts at 185 SFPM with 6 times the production per grind.

SETUP: Material—4340 heat-treated forged steel. **Speed**—185 SFPM. **Feed**—0.010 inch. **Depth of cut**—0.060-0.200 inch. **Coolant**—Yes.



FACING power shovel clutch and brake drum assembly with Grade 370 inserts cut over-all machining costs almost 70% for a Chicago mining machine manufacturer. Two Grade 370 clamp-on blanks replaced 16 tools.

SETUP: Material—1045 low carbon, high manganese cast steel, with hardness of 27 R_c. **Speed**—24 RPM. **Feed**—0.018-0.033 inch. **Depth of cut**—⅜ inch. **Coolant**—No.

all other steel-cutting carbides

Boost production as much as 366%; reduce downtime losses, tool costs

Hundreds of metalworking plants are now using Carboloy Grades 350 and 370 on their toughest steel-cutting jobs. And from plant after plant come reports of:

Reduced production time because Carboloy Series 300 carbides maintain efficiency at faster speeds, greater feeds, deeper cuts.

Reduced downtime because these new grades can take the punishment of high-speed machining . . . and stay on the job.

Reduced tool costs because Grades 350 and 370 take more regrinds; often eliminate rough finishing operations and tools.

Increased machine efficiency because Series 300 carbides have the strength and versatility to let you operate machines at upper performance limits.

The new, carefully controlled Carboloy process used in producing Series 300 imparts built-in structural rigidity *at the cutting edge*. Both Grade 350 and 370 can operate efficiently around 1800°F . . . a range where the cutting edges of other carbides deform, greatly reducing their effectiveness.

Your Authorized Carboloy Distributor can give you immediate delivery on Carboloy standard tools, inserts, and blanks in Grades 350 and 370 . . . in a wide range of sizes and styles. For the new Series 300 price list GT-305, send coupon on the next page, today.

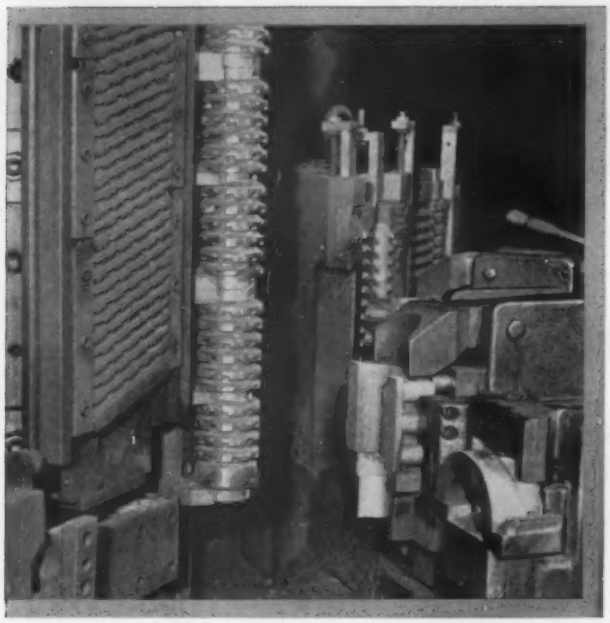
CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

OVER→

Carboloy Created-Metals for Industrial Progress

If you're machining cast iron, nonferrous metals, or plastics . . .

There's a Carboloy grade to fit your needs



BROACHING automobile bearing caps with Carboloy Grade 883 brought Studebaker a 22% saving in over-all costs. Carbide on previously used broach lasted a maximum of 24 hours; Grade 883 ran 50 days.

SETUP: Material—highly abrasive cast iron. **Speed**—28 SFPM. **Chip load per tooth**—0.005 inch for roughing; 0.0015 inch for finishing.

Carboloy tools, blanks, and inserts are available in many standard grades for machining cast iron, nonferrous materials, and plastics — as well as steel.

These grades are stocked in a wide range of sizes and styles by your Authorized Carboloy Distributor. He'll provide immediate local delivery to help you keep inventory costs down.

And your Distributor can give you expert assistance with any machining problem you may have . . . recommending the correct carbide grade and tooling method that best suits your particular job.

Send coupon, today, for price lists and specifications on Carboloy grades.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

CARBOLOY
Department of General Electric Company
11149 E. 8 Mile Blvd., Detroit 32, Michigan

☐ Please send price list and specifications on steel-cutting Grades 350 and 370.

☐ Please send price list and specifications on other standard grades.

Name_____ Title_____

Company_____

Address_____

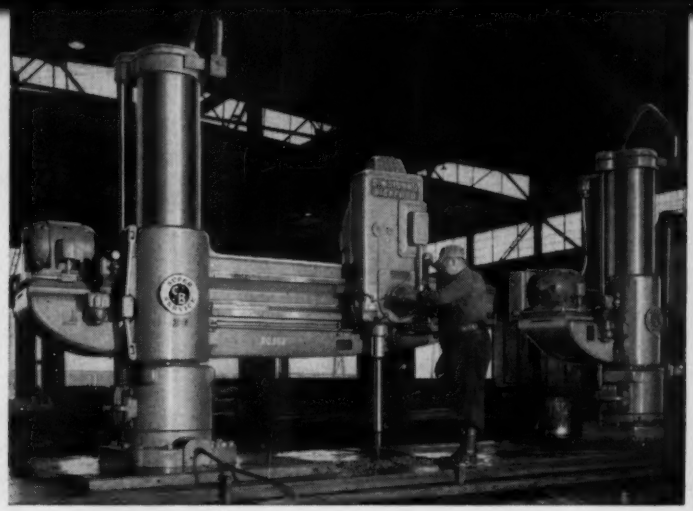
City_____ Zone____ State_____

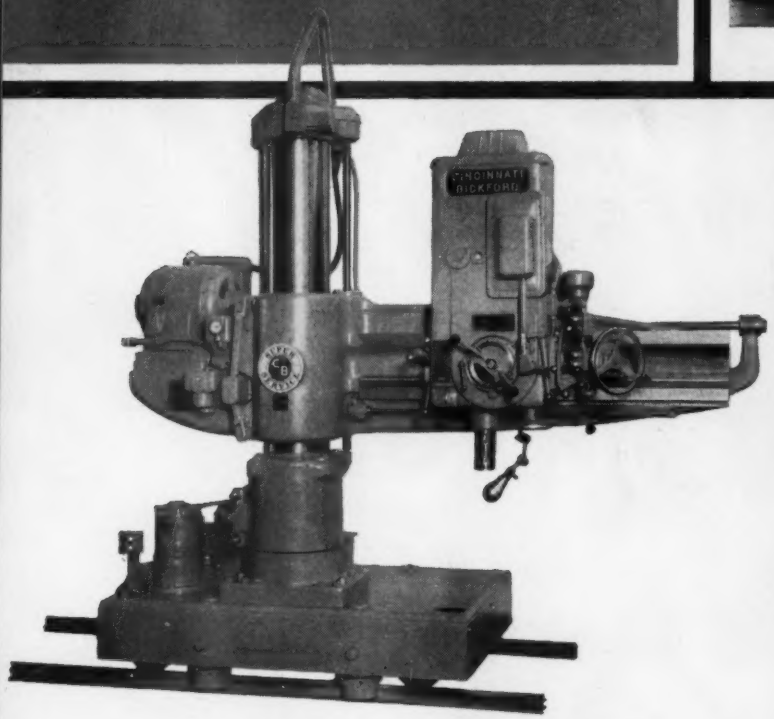
AUTHORIZED CARBOLOY DISTRIBUTORS

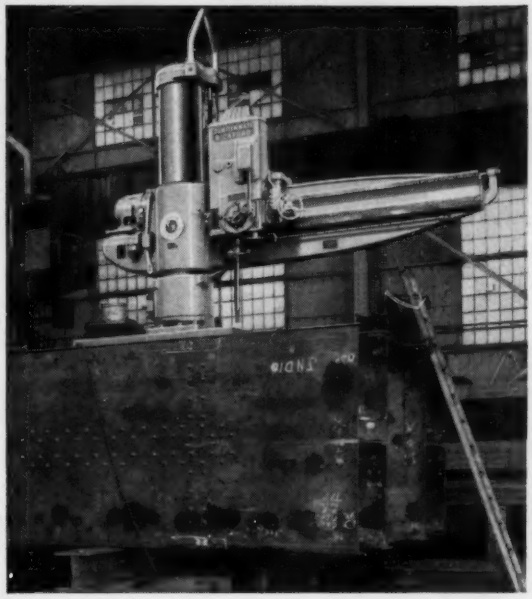
See the Yellow Pages

. . . for the name of your local Authorized Carboloy Distributor. You'll find his name under the Carboloy trademark listing in classifications: TOOLS or TOOLMAKERS.

MOVES that save you money





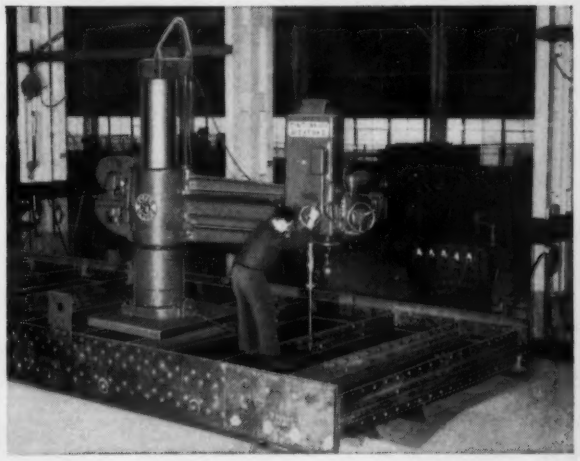


...on the large job!

These portable Cincinnati Bickford Super Service Radial Drills are effecting very large savings, up to 75% on work shown here. It is faster, more accurate and costs less to move the machine, instead of moving the work. Equipped with lifting bail, these machines are so perfectly proportioned and balanced that they need no clamping to work or floor. They do not tip or rise up while drilling.

Inquire about these portable machines—track type, sliding saddle on bed, or merely with stub base and lifting bail—they can save time and dollars for you.

Write for Bulletin R-29.



80 YEARS OF SERVICE

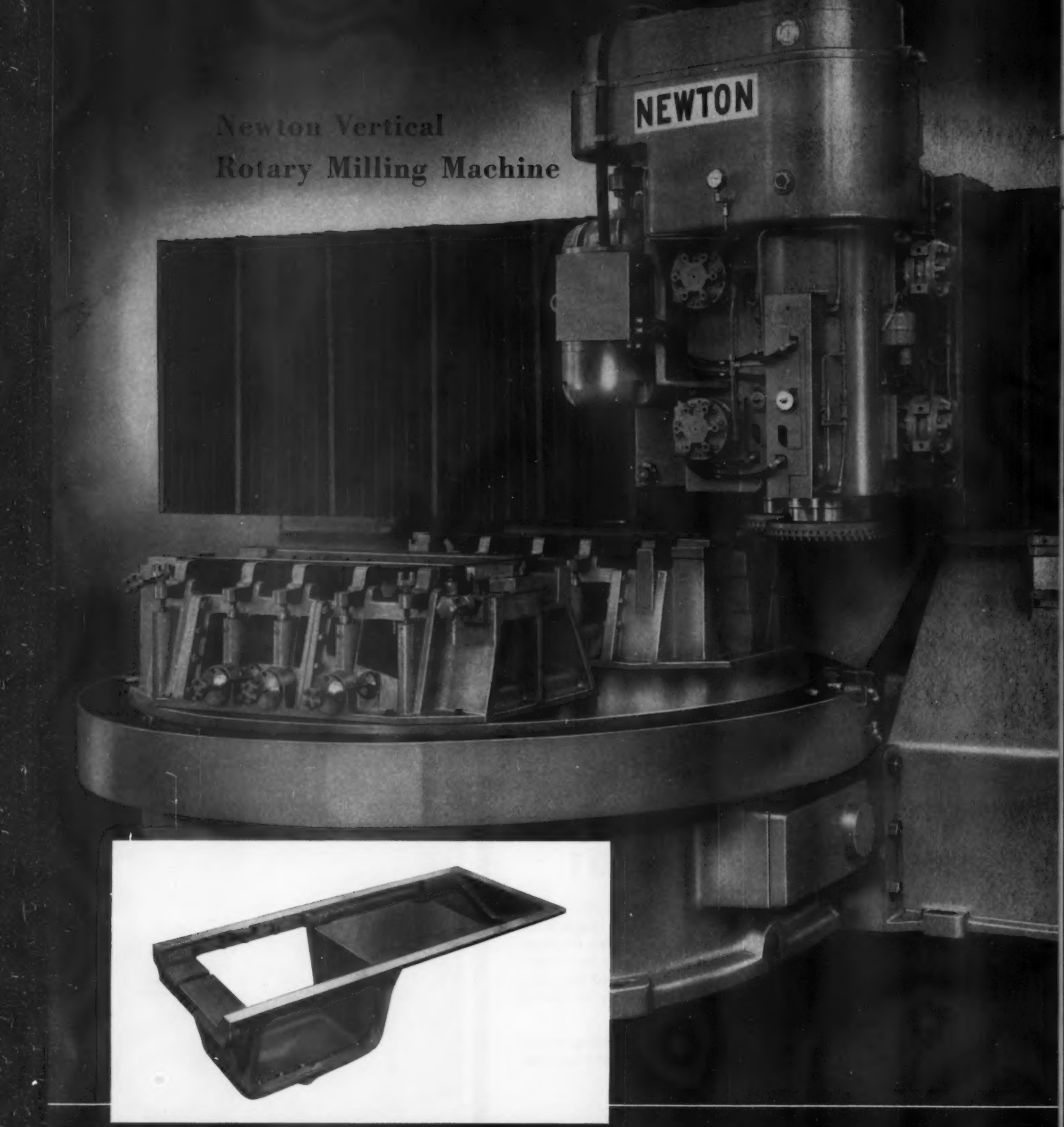
CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Newton Vertical
Rotary Milling Machine



CONSOLIDATED MACHINE TOOL

A Division of Farrel-

EXTRA RUGGED...

TWO IN ONE

Here is a Newton Vertical Rotary set up for milling diesel engine oil pans. The head feeds along the cross-rail and mills the piece in one pass.

At the end of the cut, the spindles unclamp and retract. As the head returns to its starting point on the cross-rail, the table is automatically power indexed. The spindles lower and clamp and the next pan is milled.

This machine may run several weeks on oil pans. Then, by locking the head on the cross-rail and engaging the rotary table feed, it becomes a continuous rotary milling machine for an entirely different type of job! (Fixture change-over time—less than one hour.)

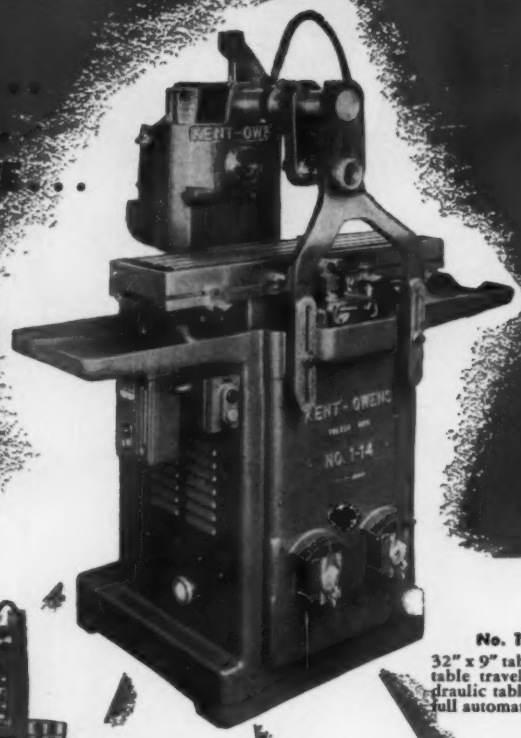
Two entirely different machines for not much more than the price of one. A good example of Consolidated's utility minded engineering.

COMPANY, ROCHESTER 10, N. Y.

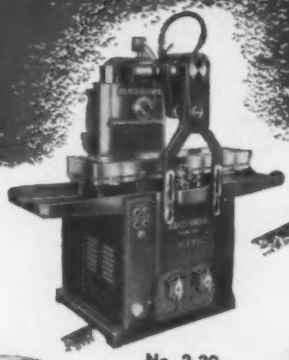
Birmingham Company, Incorporated

EXTRA RUGGED... SPEEDY... ACCURATE...

to Bring Down Milling Costs!



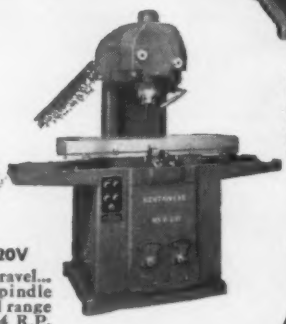
No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.



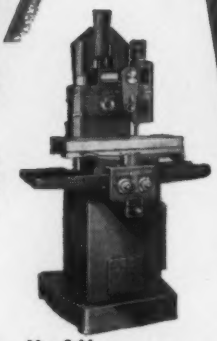
No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

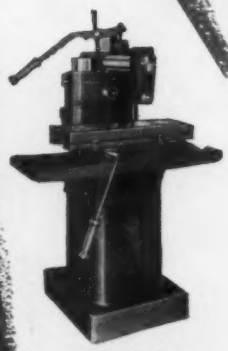
No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.



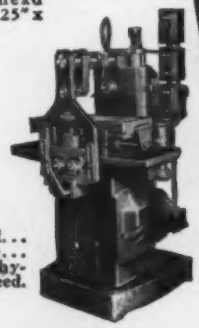
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 1-V
Hydraulic vertical head feed ... 3½" head travel ... 25" x 9" table.



No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.



No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference . . . greater dependability . . . accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

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Machinery Sales Co.

MILWAUKEE
Four States Mach'y Company

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MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Mach'y Co.

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C. F. Bolotti Machinery Co.

ST. LOUIS
Blackman & Nuetzel Mach'y Co.
Clarke Equipment Company

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J. F. Owens Mach'y Company

TORONTO, ONT.
F. F. Barber Mach'y Company

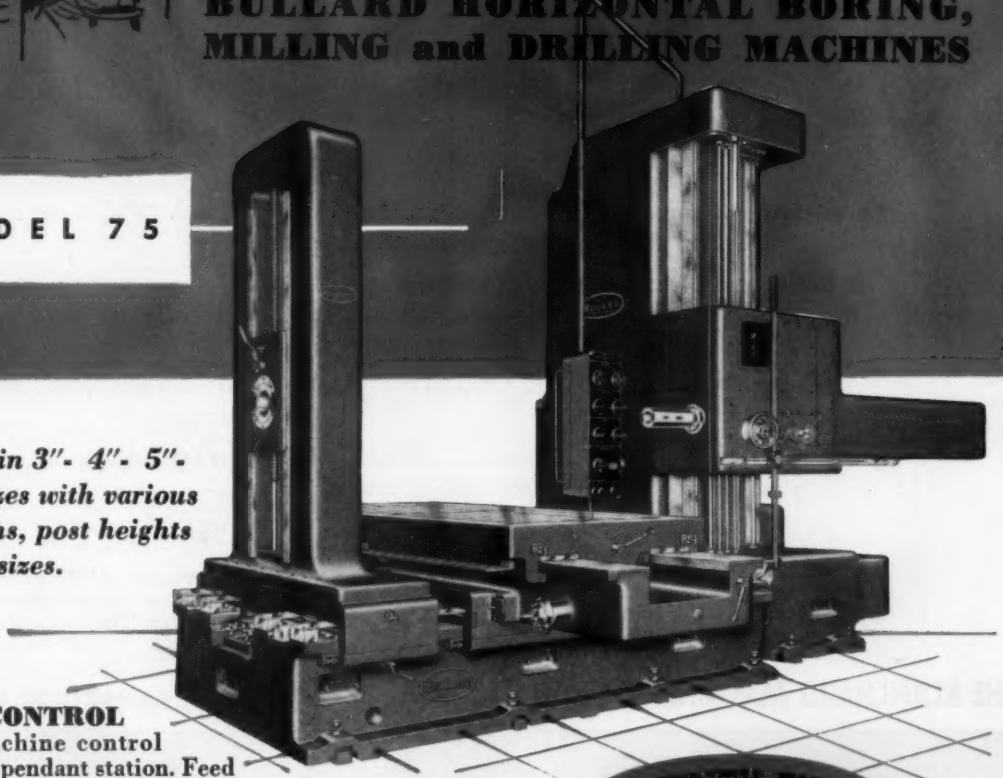
WINDSOR, ONT.
F. F. Barber Mach'y Company

outstanding DESIGN and PERFORMANCE are incorporated

in the new . . .

BULLARD HORIZONTAL BORING, MILLING and DRILLING MACHINES

MODEL 75



Available in 3"- 4"- 5"- spindle sizes with various bed lengths, post heights and table sizes.

PENDANT CONTROL – complete machine control from a movable pendant station. Feed and speed rate selection, directional feed and traverse engagement of the spindle, head, table and saddle, spindle rotation and operation of head binders are accomplished from the Pendant.

BOTH SCREW AND RACK FEED – to the spindle provide smooth, steady screw feed for boring and sensitive hand feed for small drilling and tapping.

SPEED RANGES – 9.5 to 2000 R.P.M. on 3" and 5.83 to 1200 R.P.M. on 4" and 5" sizes, meets any machining requirement.

RIGIDITY – is built into the massive 4-Way Bed, Head, Headpost and Rear Post assuring a higher degree of maintained accuracy.

OPTICAL MEASURING EQUIPMENT for head and table (optional)

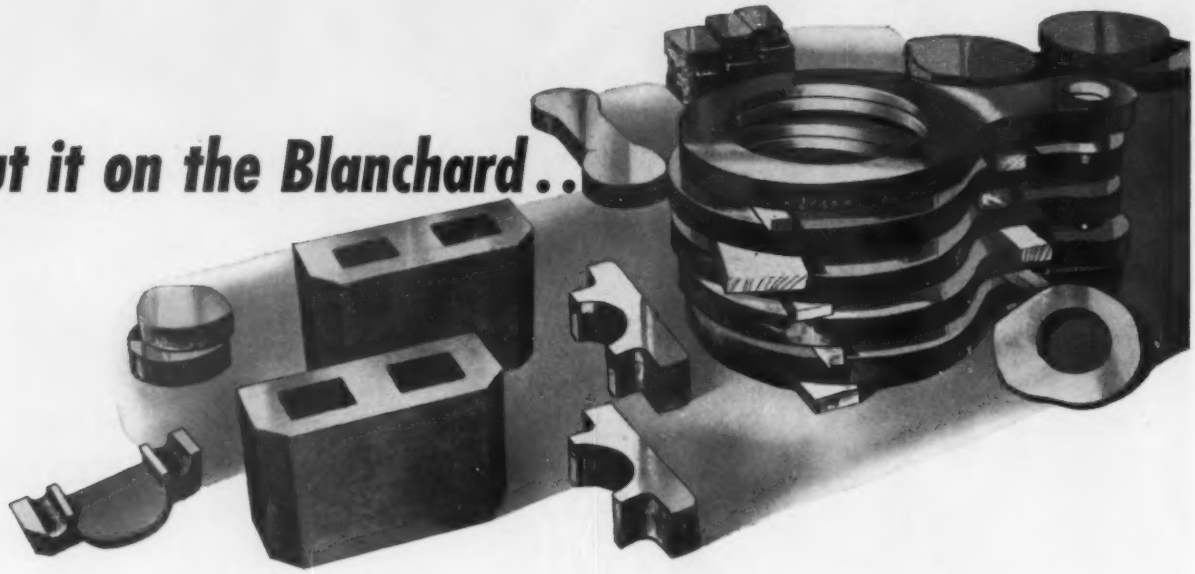
AUTOMATIC POSITIONING – for head and table (optional)

SEVENTY FIFTH
BULLARD
ANNIVERSARY

WE INVITE YOUR INQUIRIES
CALL OR WRITE YOUR NEAREST
BULLARD SALES ENGINEER OR WRITE

THE
BULLARD
COMPANY
BRIDGEPORT 2,
CONNECTICUT

Put it on the Blanchard..



it's versatile! Large and small shops alike find this Blanchard, with 72" diameter magnetic chuck, ideal for fast, precision grinding of miscellaneous work.

it holds multiple small pieces or plates, castings and die blocks up to 80" across corners, directly on the magnetic chuck. Irregularly-shaped workpieces are easily held with simple fixtures. (Custom-built grinders of this type can handle work 30" high.)

it's fast – with a hard wheel, soft steel can be "hogged off" at a rate of 10 cubic inches per minute.

it's precise – with a soft wheel, hardened steel ways are regularly ground flat and parallel to .001", with surface finish of 5 micro inches!

No wonder shopmen say this Blanchard No. 42-72 is "tops for versatility"!

Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

URGENT
re: Cimcut base additive
read-initial-pass on

OPR
CV 389
OK
CV 389 GA PLS

CINCINNATI MILLING PRODUCTS DIVISION CALLING. HIGHLY IMPORTANT ALL PLANTS USING CUTTING OILS BE INFORMED OF OUR DEVELOPMENT OF CIMCUT BASE ADDITIVE, WHICH IMPROVES TOOL LIFE, GIVES BETTER FINISH, INCREASES PRODUCTION, YET LOWERS COSTS.

CIMCUT BASE ADDITIVE IS A SULPHUR CHLORINATED OIL ADDITIVE -- CONTAINING VERY EFFECTIVE E. P. AND POLAR LUBRICATING PROPERTIES -- AND IS BLENDED IN VARIOUS DILUTIONS WITH MINERAL OILS. THUS, CAN BE USED FOR A GENERAL ALL PURPOSE CUTTING OIL.

CIMCUT BASE ADDITIVE HAS MANY OUTSTANDING ADVANTAGES, PERMITS INCREASED PRODUCTION -- AND GIVES IMPROVED TOOL LIFE AND BETTER FINISH AT HIGHER FEEDS AND SPEEDS. BECAUSE OF ITS E. P. AND POLAR FRICTION REDUCING PROPERTIES, IT LUBRICATES THE CUTTING TOOL FOR COOLER CHIP. BY REDUCING FRICTION BETWEEN CHIP AND TOOL, LESS HEAT IS GENERATED, LONGER TOOL LIFE OBTAINED, AND FINISH GREATLY IMPROVED. DOES NOT ALTER STRAW COLOR OF MINERAL OIL. DOES NOT HAVE AN OBNOXIOUS SULPHUR ODOR.

SAVES MONEY. COSTS LESS PER GALLON IN THE MACHINE THAN CONVENTIONAL PRE—BLENDED CUTTING OILS. HAS LOWER FINAL COST BECAUSE OF BETTER PERFORMANCE, REQUIRES NO SPECIAL BLENDING APPARATUS, AND MAY BE UTILIZED TO CONVERT USED OILS TO CUTTING OIL.

PLEASE INFORM ALL PLANTS OF CIMCUT BASE ADDITIVE AS QUICKLY AS POSSIBLE.
END OR GAP
OK. WILL RELAY MSG IMMEDIATELY.
END V

RJB SL
GA RAC EL CCA ARL JLH

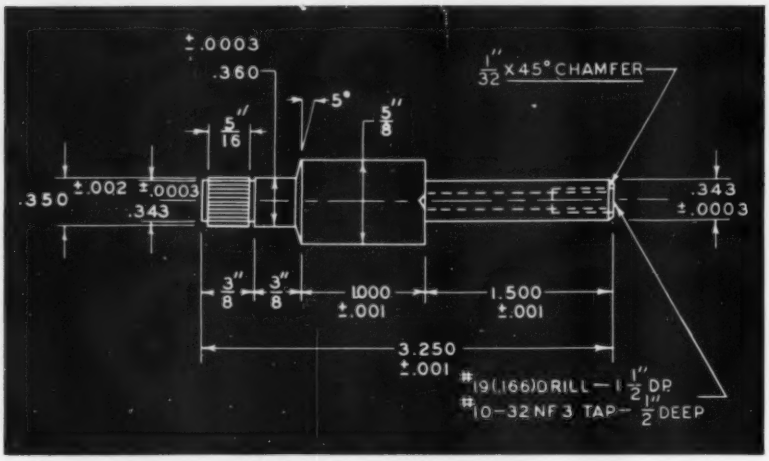
CIMCOOL
Cutting Fluids
100%
for ~~85%~~ of all metal cutting jobs
PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

Will Your Single Spindle Automatic Screw Machine Make This Part In 28 Seconds?

Tests show it normally takes your machine 3 times as long with less precision.

At demonstrations all over the country thousands of screw machine men have watched intently as the Detroit Screwmatic 750 box tool turned; spotted; deep-hole drilled; tapped, rough and finish formed; knurled; and cut off.

All this in just 28 seconds after the 5/8-inch diameter, leaded free machining steel bar stock was fed to the turret tools. And each time part tolerances were as close as ± .0003.



Dimensions and Tolerances

COMPARISON TESTS WITH 3 LEADING SCREW MACHINES

. . . in three totally independent job shops show: Each of the other three took 90 seconds or more to turn this complicated part. Each required two feed-outs. Each machined the part with tolerances ranging from ± .001 to ± .005.

The Screwmatic formed the part • with three to five times greater precision • with only one set-up • in one-third the turning time • of any one of the other three screw machines.

No wonder all who watch the Screwmatic perform say, "It's the greatest advancement in screw machine engineering in 20 years."

We invite your comparison!

These 6 Features Make This Record Possible

(1) Greater adjustable distance between turret and chuck.

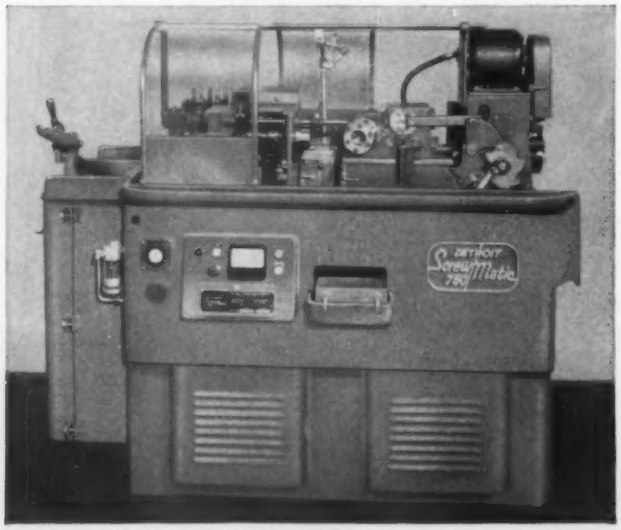
(2) Easily adjustable turret crank permits turning of long, medium, and short work with equal efficiency.

(3) Silent, endless V-belts drive spindle smoothly at high or low speeds with non-slipping power.

(4) Three infinitely variable pre-selected spindle speeds available for any work cycle. Long cuts at high speeds step down to second speed for accurate forming. Third speed taps and threads. Your present two-speed screw machine is not that flexible.

(5) A three-step V-belt drive makes choice or change of indexing time possible —from 1/4 to 1/3 to 1/2 second.

(6) Vertical slide with rugged, positive action is part of the Screwmatic's standard equipment. Easily adjustable, this third slide forms or cuts off accurately.

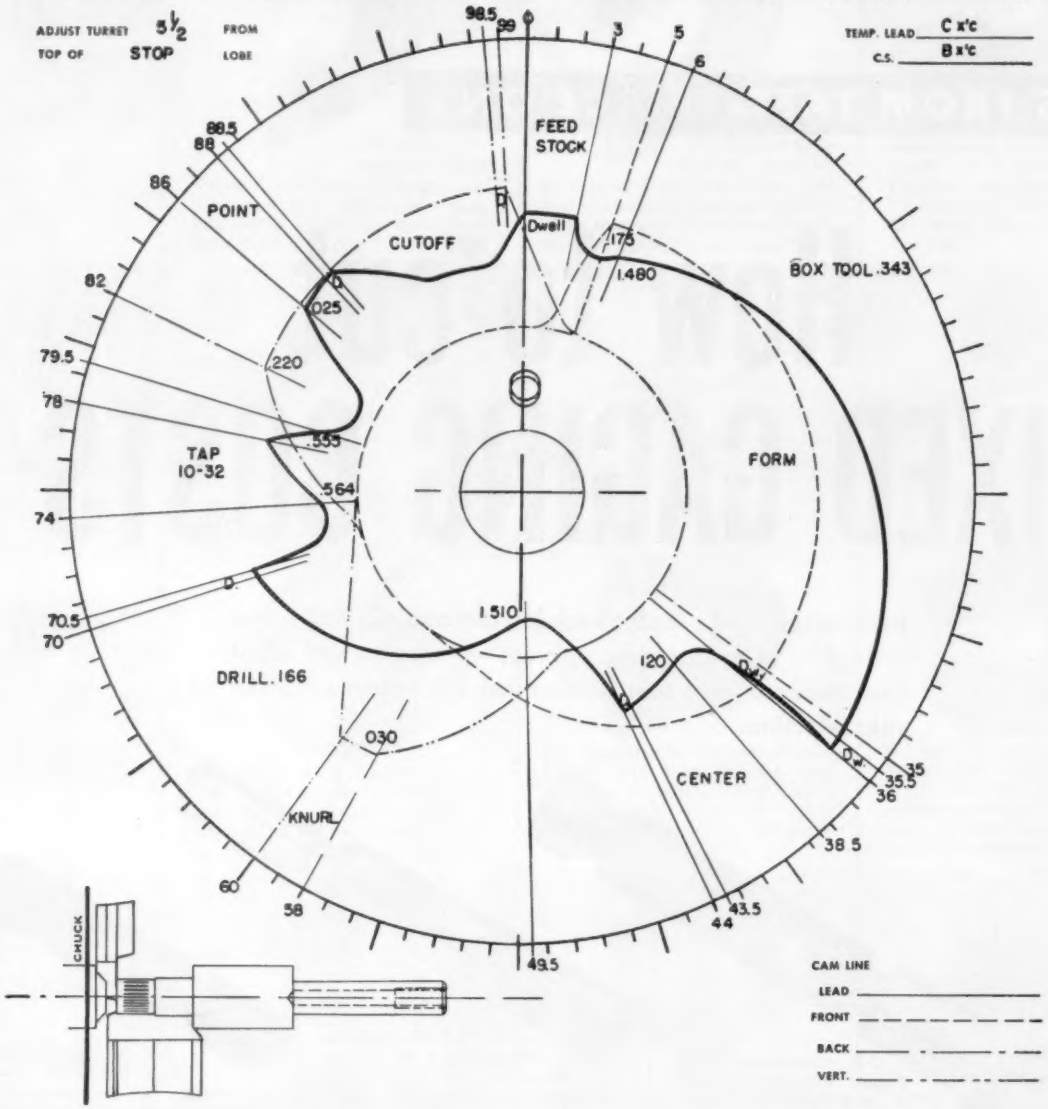


Send for new six-page folder of facts, photos, and specifications. See it yourself at your dealer's. Write for name of dealer nearest you.

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

BOOTH NO. 315

COMPARE YOUR CAM LAYOUT WITH THE SCREWMATIC'S



OPERATION	THROW	FEED	REV.	REV	100	TOTAL	CD.
FEED STOCK - ORS Rev. Stop	Dwell			15.	3	3	1¼
Index & FORM	.175	.0007	250	15	3	6	
BOX TOOL - ORT Boyar-Schultz	1.480	.006		156	30	36	0
Index				15.	2.5	38.5	
CENTER - 5/16" in ODRH Holder	.120	.003		40	5.5	44	1⅜
Index & KNURL	.030	.002	15	15.	5.5	49.5	
DRILL - Rev. Deep Hole Drill	1.510	.0034	445	180	21	70.5	1¼
Index & Change Speed to 1000				15.	3.5	74	
TAP IN - 1000 S.S.	.564		18	33	4	78	1 7/16
TAP OUT - 3100 S.S.	.555		18	10	1.5	79.5	
Index & Change Speed to 1800				15.	6.5	86	
POINT - OAP Boyar-Schultz	.025	.0015		17.	2.5	88.5	1⅛
CUTOFF	.220	.0015	150	95	10.5	99	
Clear					1	100	

MARK ON LEAD CAM P. & T. NO.
S.S. 1800-1000 R.P.M. FWD.
3100 R.P.M. BKWD.
GEARS 63-47
SEC. 28 G.P.H. 128 D.S. 180 R.P.M.

MARK ON CROSS SLIDE CAMS P. & T. NO.
FRONT FORM BACK CUTOFF VERT. KNURL

MAT. 5/8 Rd. Ledloy
MACHINE SCREWMATIC-750 SERIAL

A Product of the
GEAR GRINDING MACHINE CO.
3935 Christopher, Detroit 11, Michigan

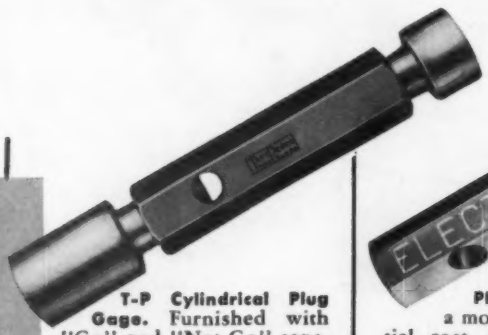
DETROIT Screw Matic 750

TIPS FROM TAFT-PEIRCE ON:

How to cut FIXED GAGING COSTS

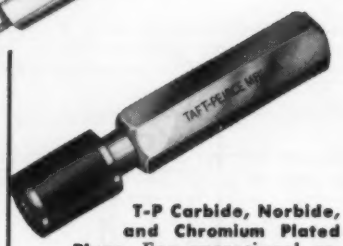
Picking the *right* gage for each job can result in substantial savings — in gaging time, upkeep, replacement and initial cost. Here are some comparisons that will help you to make your selection.

Plain Plugs



T-P Cylindrical Plug Gage. Furnished with "Go" and "Not Go" separately, or on opposite ends of handle. Progressive gage — with "Go" and "Not Go" on same end increases speed.

T-P Electrolized Plug Gages. With only a modest increase in initial cost, substantially longer wear life can be obtained with this exclusive surface treatment. Many users report up to 3 times longer gage life.

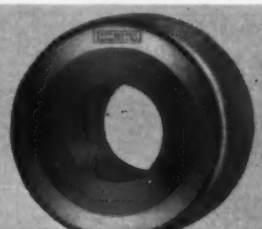


T-P Carbide, Norbide, and Chromium Plated Plugs. For exceptional resistance to abrasion or scratching. Maximum wear-life. Brittleness requires care in handling.

Plain Rings

T-P External Ring Gage. For reference purposes, setting air or other variable gages and accurate size control of parts.

T-P Chromium-Plated Ring. Lowers gaging costs on longer runs of highly abrasive materials or hardened steel. Provides up to 5 times more service.



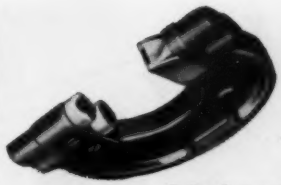
T-P Norbide and Carbide Rings. For greatest wear-resistance. Available in Norbide and Tantalum or Tungsten Carbide. Brittleness requires careful handling.

THE TAFT-PEIRCE
WOONSOCKET,

Adjustable Snaps

T-P Plain Adjustable Snap Gages. Available with gaging pins, round or square buttons, and solid anvils in combination with buttons.

T-P Midget Snap Gages. Smaller in size and section, their light weight aids in gaging small or delicate parts. Maximum rigidity and stability are provided.



T-P Cemented Carbide or Norbide Snaps. For close tolerance work on abrasive materials. Gaging members tipped with Tungsten or Tantalum Carbide. Or with Norbide inserts, as shown.

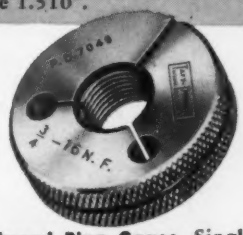
Thread Plugs

T-P Limit Thread Plug Gage. Available in Taper Lock or Trilock design. Taper Lock up to 1.510". Reversible from No. 0 to ½". Reversible Trilock above 1.510".

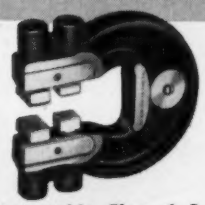
T-P Carbide Thread Plug Gage. For longer wear. Furnished both standard and special from #8 machine screw size up.

T-P Truncated Thread Set Plug Gage. Sets and checks thread gages with greater accuracy. Checks thread angle and O. D. Indicates wear, or oversize.

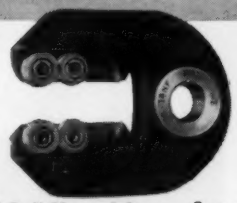
Thread Rings & Snaps



T-P Thread Ring Gages. Single unit clamping device simplifies setting, increases accuracy, eliminates distortion. Locks without changing pressure on ring.



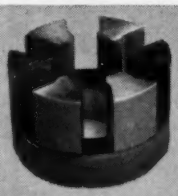
T-P Adjustable Thread Snaps. Faster than ring gaging, and just as accurate, they check lead, angle, and all other thread elements. Variable pitch diameter.



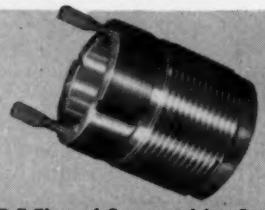
T-P Roll Thread Snaps. Same as Adjustable, with *rolls* for gaging members. Since gaging members rotate, wear is spread over greater surface and service life increased.

Special Gages

T-P Rotochek. Fastest thread gaging method. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages.



T-P Spline Gages. A special gage due to the diversity of individual requirements. Thousands of such special gages are made at Taft-Peirce every year.



T-P Thread Concentricity Gage. Checks size and location of internal threads. Another example of infinite variety of fixed gages made by T-P.

Gage Blocks

T-P Gage Blocks. For the ultimate in accuracy. Measures increments down to 0.00005". Available in small or large sets, or individually. Carbide Wear Blocks also available.

MANUFACTURING COMPANY
RHODE ISLAND

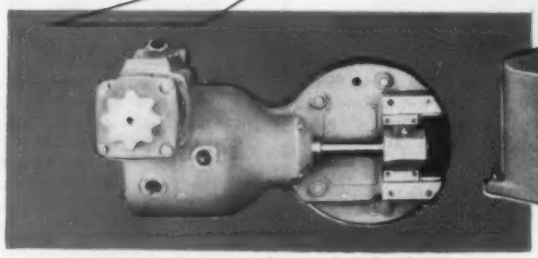
T-P means Top Precision

T P

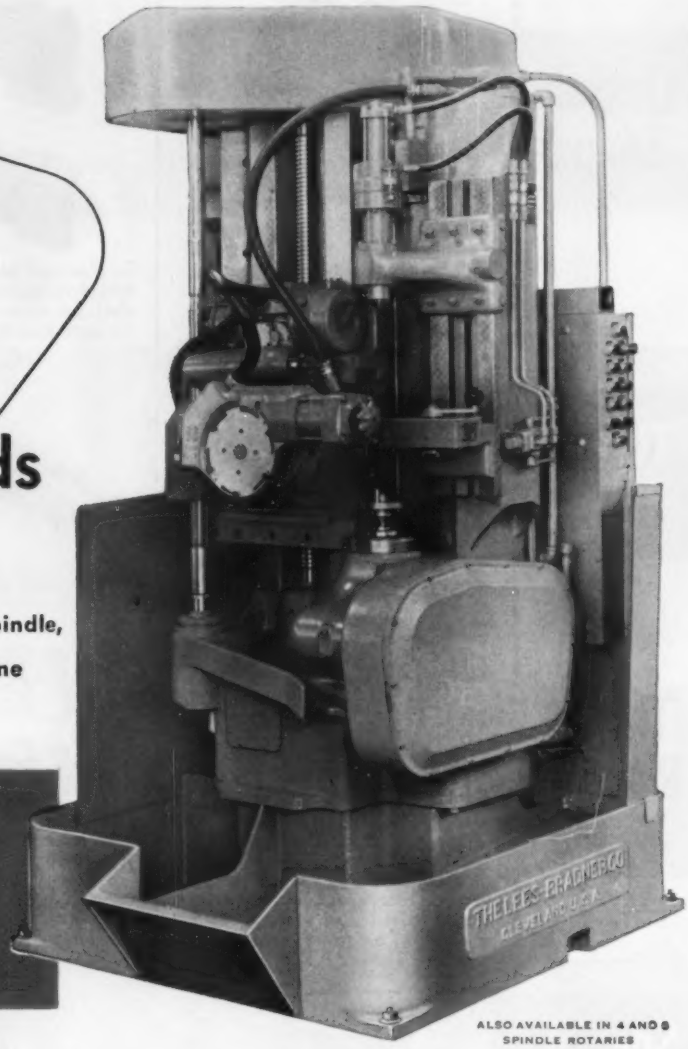
For the complete story on these items, and many more, get your copy of the new Taft-Peirce Handbook.

Hob today at tomorrow's speeds

with the new Lees-Bradner Model 7, Type HD Single Spindle, High Speed Hobbing Machine



Close-up shows new, heavier hob head with Timken bearing construction, 3-inch hob shift and new outer support.



ALSO AVAILABLE IN 4 AND 8 SPINDLE ROTARIES

Capacity TODAY to meet tomorrow's production requirements is a built-in bonus feature of Lees-Bradner Hobbing Machines.

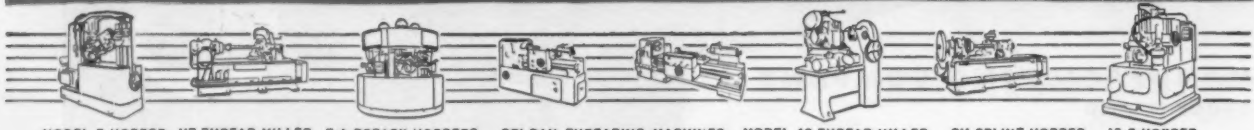
The new Model 7, Type HD Single-Spindle High Speed Hobber for example, is a heavier, faster machine than its prototype. Weighing approximately 1,000 lbs. more, a heavier headstock and heavier column gives you the added rigidity to perform better and faster the excellent job done by its predecessor, the Type "A".

Designed-in production capacity to take care of tomorrow, as well as today, offers savings in time and labor. To industry, constantly pressed for higher production, these savings mean more than dollars. They mean *satisfied customers.*

For the whole story and a demonstration, contact your Lees-Bradner representative. Or, write us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in high maintenance costs

LOOK beyond the age of your equipment when considering whether maintenance costs indicate your need for new machine tools. The design of equipment and the method of processing used are equally important factors.

For example, fast spindle speeds and the necessity of maintaining perfect alignment between spindle and the fixture or chuck, call for frequent adjustment, repair and replacement of parts.

You can greatly reduce such maintenance costs through the Microhoning* process—which employs comparatively slow spindle speeds and self-alignment of tool and workpiece. And the design of Microhoning equipment makes easily accessible all components likely to require servicing...follows industry-accepted standards, such as the J.I.C. electrical and hydraulic codes, to provide greater safety to both operator and machine.

In reviewing your processing methods and equipment, you may discover your maintenance costs are greater than the price of new Microhoning equipment. In short, you may be paying right now for new machine tools you don't have.

PART:

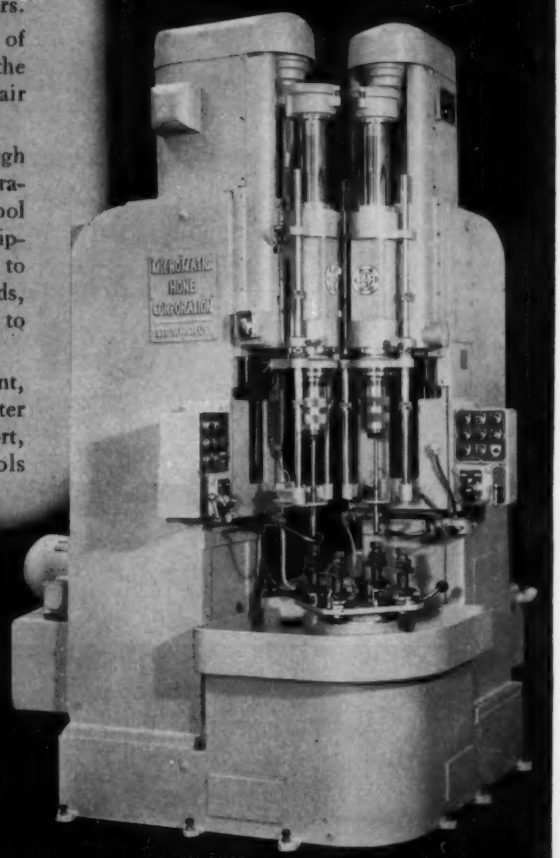
Cluster gear—bore must be straight and concentric with gear teeth.

PROBLEM:

Excessive maintenance costs on fixture driver and chucks.

SOLUTION:

MICROHONING—Simple stationary fixture—self-aligning tools—straight bore concentric with gear teeth—increased production.



*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

Visit Booth 1211 at the Show. See other examples of how Microhoning saves on maintenance.

MICROMATIC HONE CORP. MICRO-MOLD MFG. DIV. Boston Post Road Guilford, Connecticut

MICROMATIC HONE CORP. 2205 Lee Street Evanston, Illinois

MICROMATIC HONE CORP. 1535 Granda Vista Avenue Los Angeles 23, California

MICROMATIC HONE LTD. 330 Grand River Avenue Brantford, Ontario, Canada

MICROMATIC HONE CORP. MICRO-MOLD MFG. DIV. 231 So. Pendleton Avenue Pendleton, Indiana

THE MACHINE TOOL SHOW CHICAGO, ILL. SEPT. 6-17, 1955 INTERNATIONAL AMPHITHEATRE

REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Perine Machinery & Supply Co., 1921 First Ave. South, Seattle 4, Washington

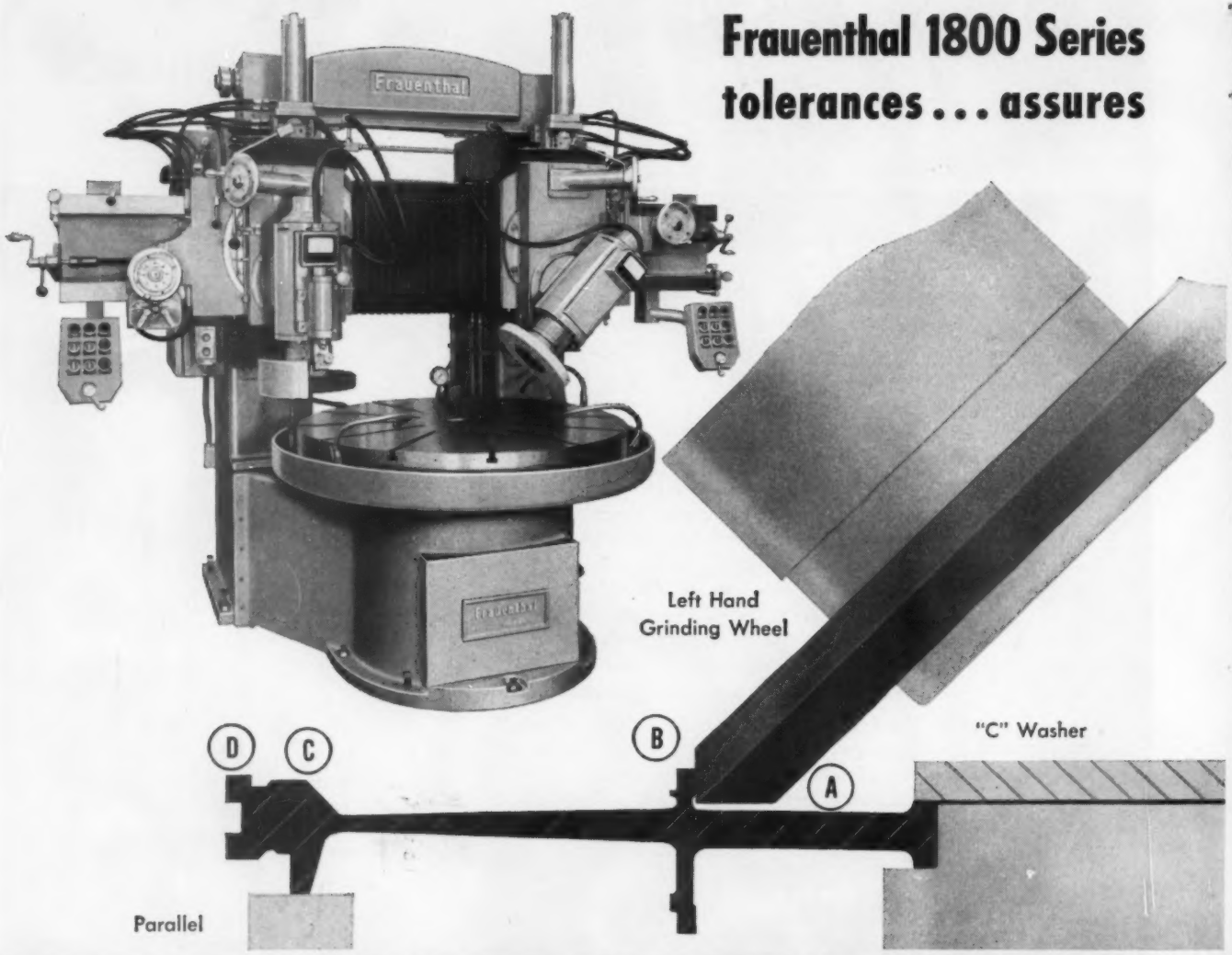
REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

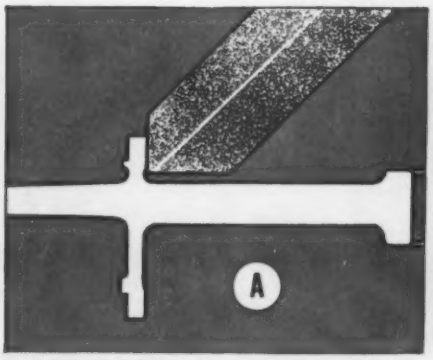
MICRO-PRECISION DIVISION • 2205 Lee Street, Evanston, Illinois

Hydraulic controls • Diesel fuel injection equipment

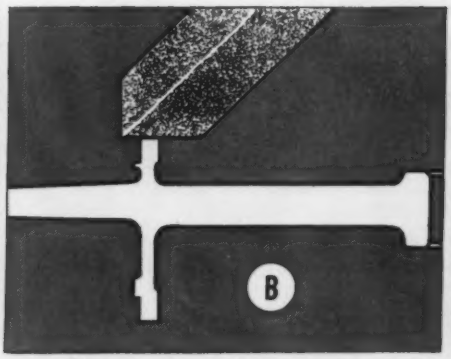
Multiple Grinding Operations

Frauenthal 1800 Series tolerances . . . assures

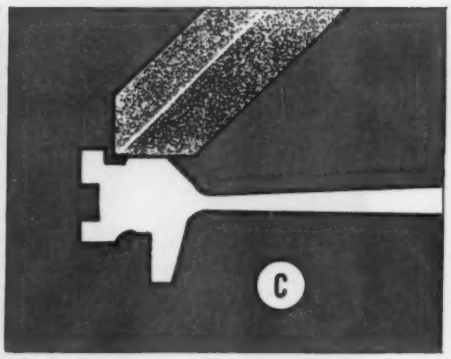




Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.



Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand



grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

Frauenthal Division

in One Set-Up

Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

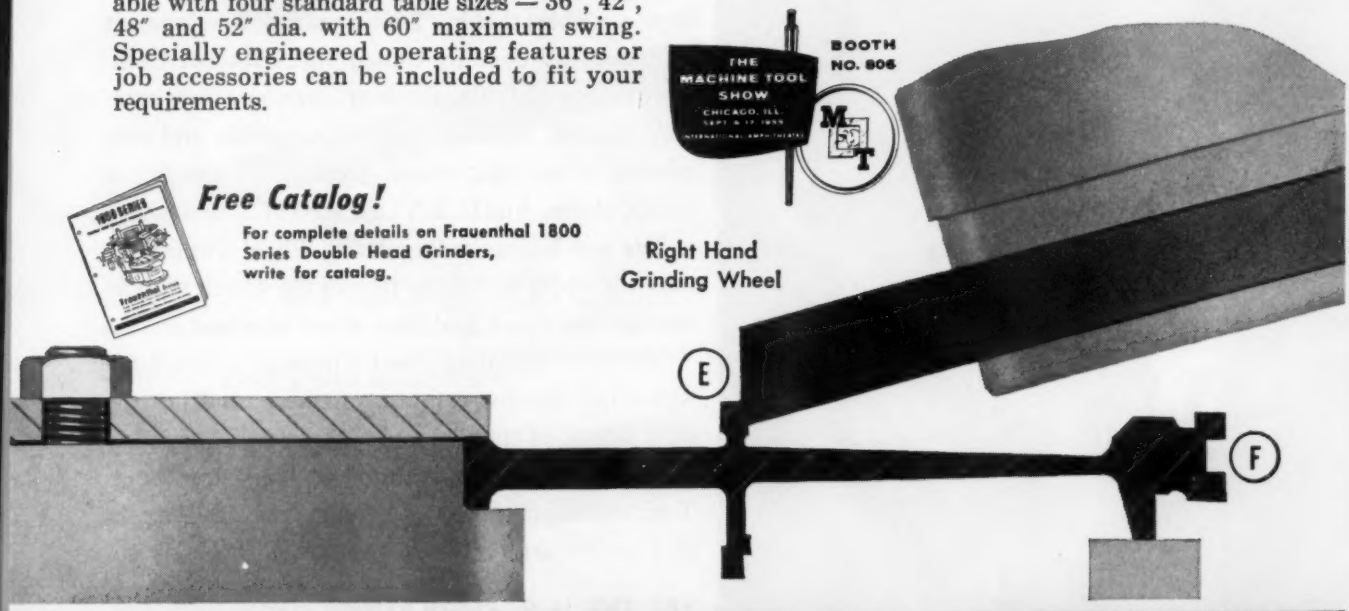
Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

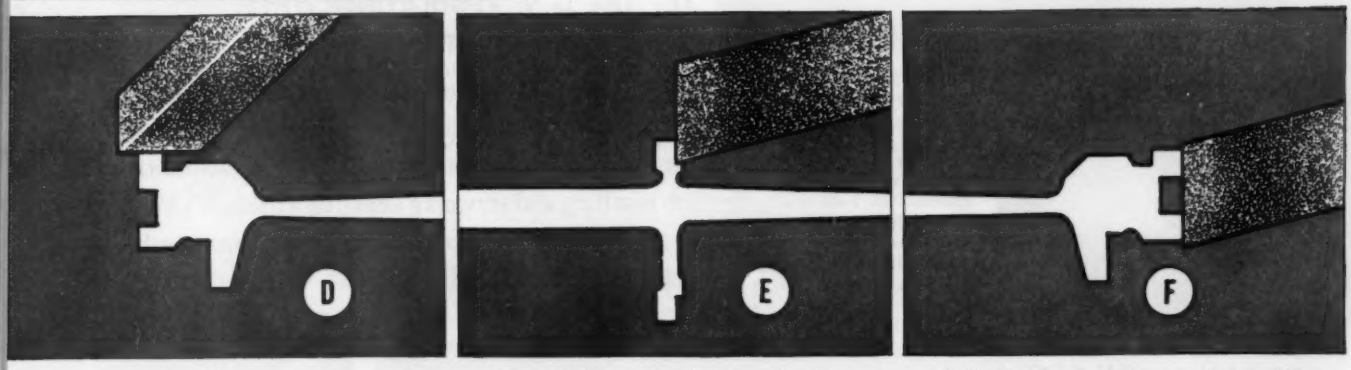
With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.

Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.





Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN

The regulating wheel that does 2 jobs!

1 provides close sizing on infeed grinding to very low tolerances

2 withstands the punishment of whipping in bar grinding

The U. S. VULCANITE Centerless

The U. S. Vulcanite Centerless Regulating Wheel is shown on a grinder, above. This wheel requires less infeed, enabling the operator to hold size better. Unusually close tolerances can be attained. The wheel has a snug arbor hole and runs true.

Here is a wheel that has 2 solid years of development behind it—all done by United States Rubber Company technicians. *The needs of customers were carefully studied.* Industry required a durable and economical wheel that would meet the 2 conditions named above. And U.S. VULCANITE is that wheel.

The new Vulcanite Regulating Wheel is unusually uniform—both across the face of the wheel, radially through the wheel, and from wheel to wheel.

This new regulating wheel is made of a compound which has extreme resistance to wear, and just the right degree of traction and cushion. It requires less infeed, enabling the operator to hold size better. Tolerances can be held to as close as one and 2 tenths of a thousandth on the finished piece.

YET THE U. S. REGULATING WHEEL COSTS NO MORE THAN ORDINARY WHEELS!

EXTRA DIVIDEND: When you buy wheels from United States Rubber Company you are buying *direct* and are being served by a specialist—a man whose only job is selling and servicing abrasive wheels. It s his job to see that you get top value for your abrasive wheel dollars.

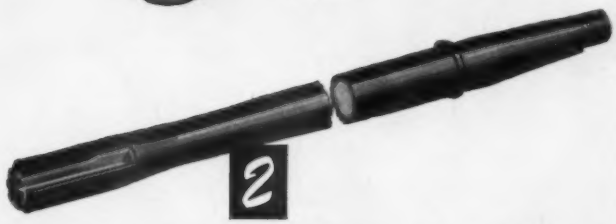
"U.S." Research perfects it . . .
"U.S." Production builds it . . .
U.S. Industry depends on it.

UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes
Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

7 WAYS to SAVE MONEY with TOCCO* Induction Hardening

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½c saved on every piece — $4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.



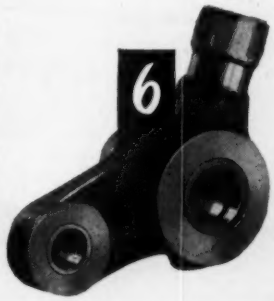
$375 per day! When Salisbury Axle switched to TOCCO-hardening axle shafts. Less machining—30 seconds instead of 2 minutes—means lower tool cost. Also production zoomed from 50 to 120 per hour. TOCCO hardened shafts have 200% greater torsional life.

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from $1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.

Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from $5.45 to $3.25 per hundred parts—a savings of 2c per pin, $26.40 per production hour.

Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.



7 Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U.S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. B-5, Cleveland 1, Ohio
Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

HARTFORD SPECIAL OFFERS FIRST

AN ANNOUNCEMENT

We are proud to announce our purchase of the complete line of "Delta-Milwaukee" Air Hydraulic Drill Units from the Rockwell Mfg. Company of Pittsburgh to complement our present line of mechanical and hydraulic, quill and way type units.

AN OBJECTIVE

To bring the benefits of automatic tooling methods within the reach of *every* manufacturer by making available standardized, low cost, well engineered machine components—drill units, tapping units, index tables, machine bases, mounting brackets and other accessories.

Check the Features of Controlled Power for Drilling, Tapping, Reaming, Spot-facing, Centering, Hollow Milling, Chamfering, Countersinking, etc.

POWER CONTROL THROUGH AIR HYDRAULICS—Air, an excellent power source of stored energy, released as desired. Hydraulics, as positive a stop as steel, yet fluid for infinite control. ***The best qualities of both air and hydraulics are combined in the Hartford Air-Hydraulic Drill Unit.***

FULL REMOTE CONTROL—Built-in standard limit switches actuated at each end of spindle travel provide absolute electrical interlock with other units

FLEXIBLE HYDRAULIC FEED CONTROL—Permits quick setting of any feed rate for maximum production consistent with tool life. No mechanical wear, no tool jump on breakthrough.

ABSOLUTE DEPTH CONTROL BY POSITIVE STOP—Micrometer control, adjustable within .001 inch. Holds depth to within .0005 inch.

HIGH RAPID TRAVERSE, POSITIVE STOPS—Rapid approach and return at from 5 to 6 inches per second. Positive stop permits approach of tool to within .010" of work.

SEALED UNIT CONSTRUCTION—Permits mounting of unit in virtually any position without regard to lubrication or hydraulic reservoir.

HARTFORD *Special*

Machine Tool Division, THE HARTFORD SPECIAL MACHINERY CO.

COMPLETE DRILL UNIT LINE!

CONDENSED SPECS . . . 3 Models, 15 Drive Arrangements

Model No.	Drilling Capacity Mild Steel	Tapping Capacity Steel	Maximum Stroke	Horse Power	Spindle Speed Range	Feed Range	Rapid Approach Rate	Rapid Return Rate	Standard* Spindle Nose
19-150	5/16" dia.	5/8"	1½"	⅓ to ¾	300 rpm to 10,000 rpm	0-70 ipm	350 ipm	300 ipm	#2 Jacobs external taper
19-400	5/8" dia.	1"	4"	¾ to 2	100 rpm to 5,000 rpm	0-50 ipm	300 ipm	240 ipm	#2 Morse internal taper
19-600	1¼" dia.	2"	6"	1½ to 5	28 rpm to 3,450 rpm	0-180 ipm	Adj. to 300 ipm	Adj. to 240 ipm	#4 Morse internal taper

* Special spindles available on request.

If in your plant you drill, tap, ream, spot-face, center, hollow mill, chamfer or counter-sink and you want to cut costs, send for this catalog . . .

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
282 Homestead Avenue
HARTFORD 12, CONN.

☐ Please send me new Drill Unit catalog, with application Data Sheet.

☐ Please have Field Engineer call.

Name_____ Pos._____

Company_____

Address_____

City_____ Zone____ State_____

C-501 5

Hartford 12, Conn., U.S.A.

SUPER
Standard Carbide Reamers
In Stock! All Types!

STC

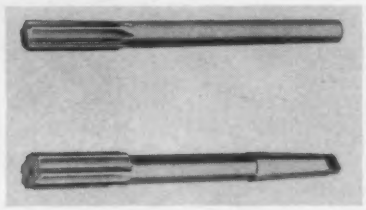
Super Carbide Tools are stocked by leading industrial supply houses across the nation. Write now for Catalog No. 55 describing the complete Super Tool line, prices.

QUALITY CARBIDE TOOLS

Super TOOL COMPANY

21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

NEW, COST-SAVING SEMI-FINISHED CARBIDE REAMERS



Super Tool Company, Detroit manufacturer of precision carbide tools, has recently announced the availability of a complete line of cost-saving *Semi-Finished Carbide Reamers*, made in a wide variety of sizes and types to accommodate almost any application.

REDUCED TOOL INVENTORY

Mr. Gordon Birgbauer, president, says, "The obvious advantage of *Semi-Finished Carbide Reamers* is reduced tool inventory; you need keep only a limited stock on hand and grind to required diameter when needed. Of course, you also benefit by the lower initial cost of these reamers by doing your own finish-grinding."

.020" GRINDING STOCK

All Super semi-finished reamers are furnished with .020" grinding stock, enabling your tool room to turn out any size within each range in a hurry to meet emergency needs. They are furnished in regular and flute-long types, with either straight or tapered shanks. All sizes are stocked by leading tool and industrial supply houses everywhere.

FREE DESCRIPTIVE LITERATURE

Super Tool Company manufactures a large line of carbide tools including milling cutters, end mills, drills, ejector tools and single point tools in both standard and special types. Catalog No. 55 describes the complete line and is available free on request to the manufacturer. **Super Tool Company, Dept. 343, 21650 Hoover Rd., Detroit 13, Michigan.**

(Advertisement)

Hartford 12, Conn., U.S.A.

City Zone State

C-501 5

EXTRA VALUE..FROM GASOLINE TO SUN'S METALWORKING OILS

Sun Oil Company makes over 400 petroleum products ...refines better value into every one of them

Sun puts the same extra value into its metalworking oils that it puts into famous Blue Sunoco—Premium Performance at Regular Price.

EXAMPLE: About ten years ago Sun became aware of a hidden source of trouble in metalworking... inadequate lubrication of the ways which support the tables or carriages during a machining operation. The costly result of this inadequate lubrication is called "stick-slip" or jumpy table. This stick... slip...stick (or jump) is often less than a thousandth of an inch...hard to detect and yet enough to cause poor finish, rejects, reduced tool life and a fall-off in production.

SOLUTION: Sun developed its now famous Sunoco Way Lubricant—a product so outstanding in its ability to overcome "stick-slip" that today, more than ten years later, it still is the standard of the metalworking industry.

RESULT: The extra value of Sunoco Way Lubricant has been proved so conclusively that it is approved by more than 55 of the country's leading machine tool manufacturers.

For EXTRA VALUE in petroleum products... buy Sun!

Please turn to the next page

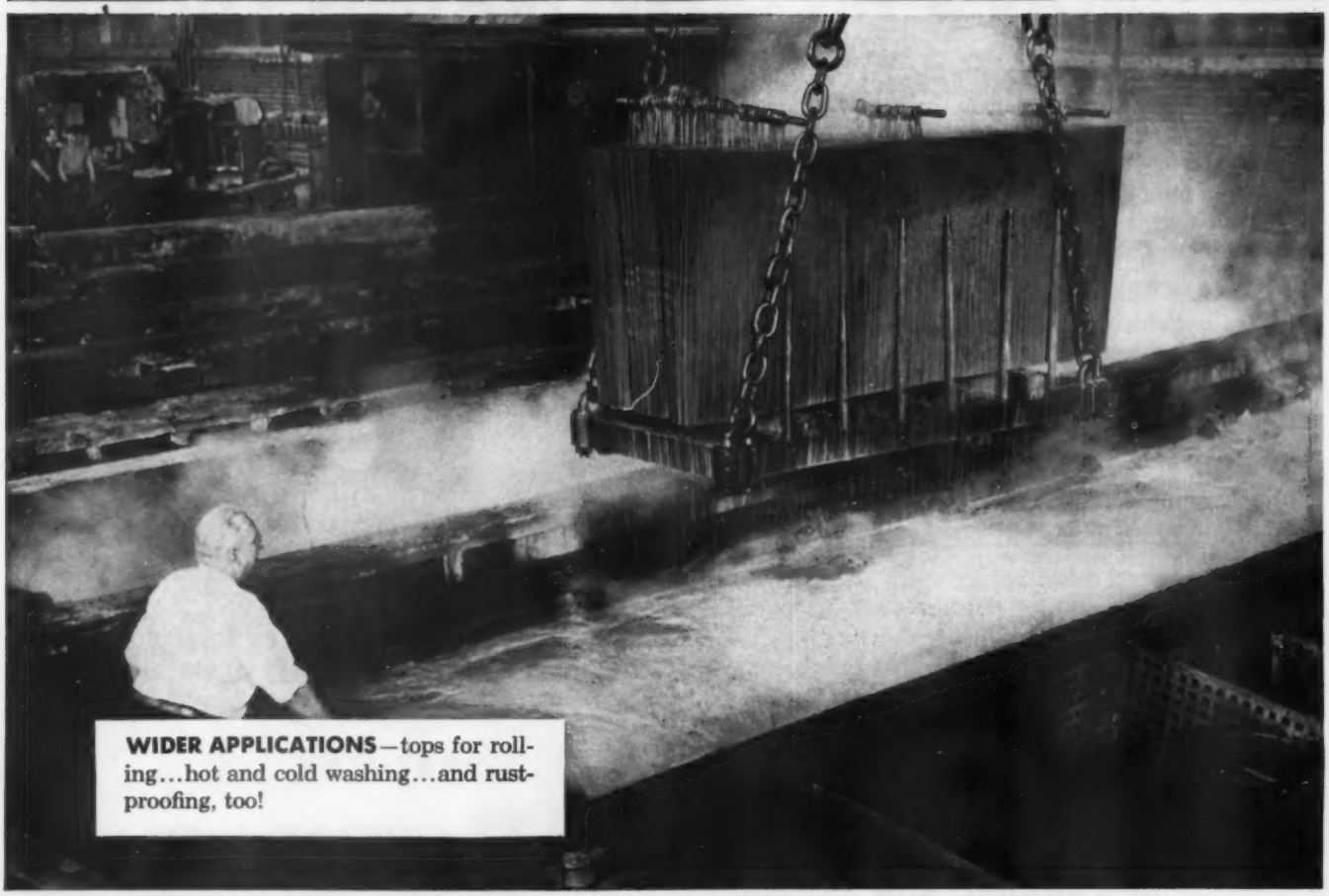
SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

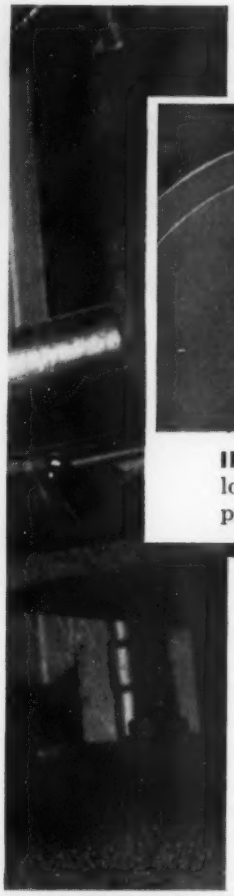
SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LTD., TORONTO AND MONTREAL

GREATER COOLING POWER—better finishes...tools last longer...production costs reduced.

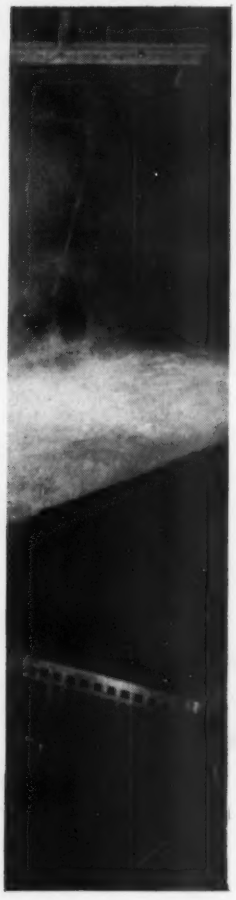


WIDER APPLICATIONS—tops for rolling...hot and cold washing...and rust-proofing, too!



INCREASED DETERGENCY—prevents loading and glazing of grinding wheels, prolongs wheel life.

NEW S.E.C.O.—pours and mixes easily... has better operator acceptance . . . keeps parts and machines cleaner.



Industry's most widely used soluble cutting oil continues to give highest machining efficiency

OVER 100 MILLION GALLONS OF S.E.C.O. EMULSIONS USED IN '54

The reasons? Simple.
Primarily, industry has faith in Sunoco Emulsifying Cutting Oil. Its high machining efficiency has proven itself over a period of years. S.E.C.O. is the original 100% petroleum emulsifying cutting oil. 'Way back in 1916, machinists started using S.E.C.O.

Constantly improving in quality over the years, S.E.C.O. is now better than ever. During 1954 new refining facilities once more improved industry's most widely used cutting oil... gave users even higher machining efficiency ...better finishes...longer tool life... increased production.

Test the new S.E.C.O. in your own plant. Notice how its high detergency and purity keeps tools, parts and machines clean...how easily it mixes in hot, cold or hard water. Notice, too, how S.E.C.O. cuts operating costs... improves rolling operations, hot and cold washing, and rustproofing.

See for yourself why Sun's S.E.C.O. continues to be the leading emulsifying cutting oil in the country today. For information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-5.

SUNOCO

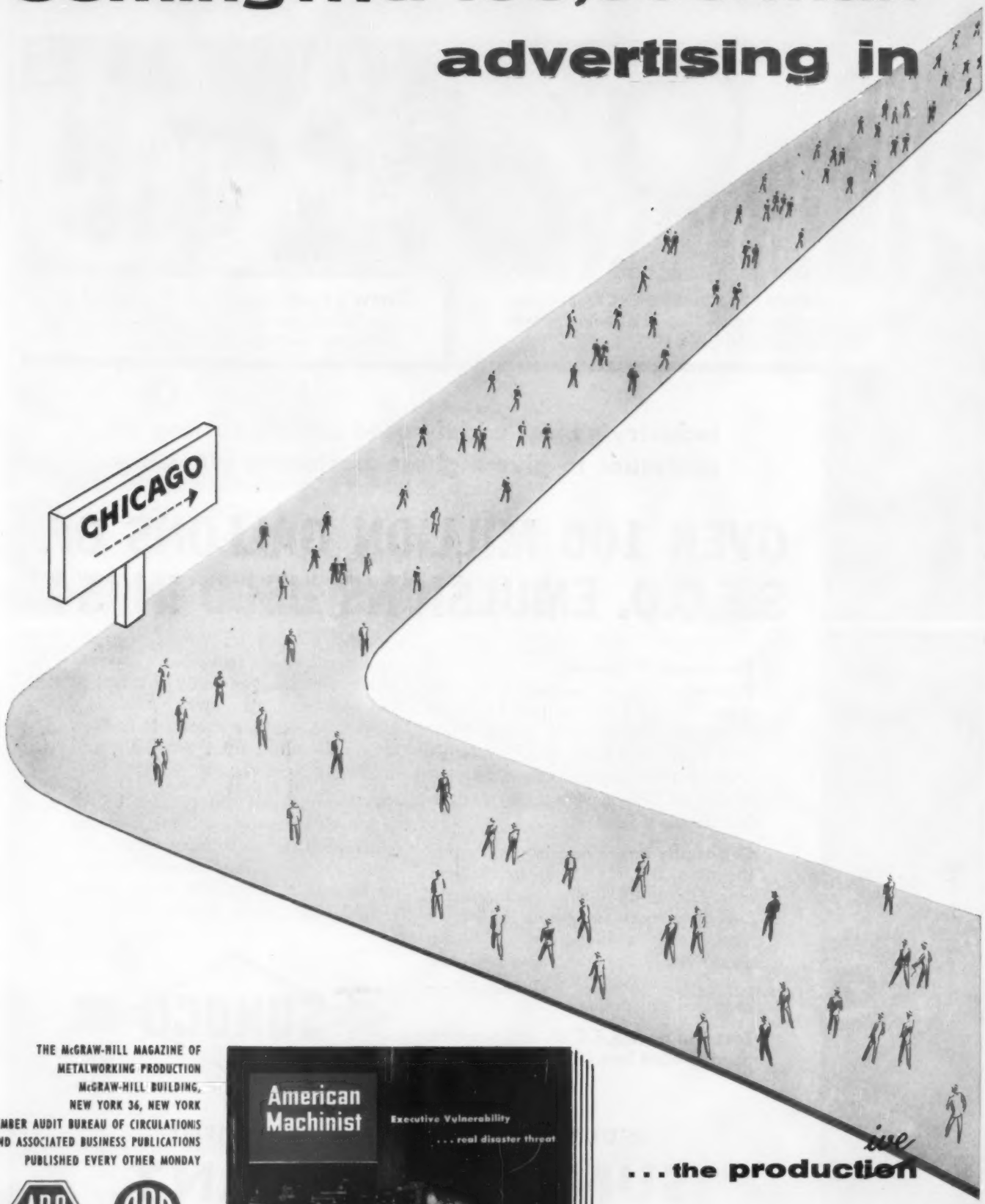
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LTD., TORONTO AND MONTREAL

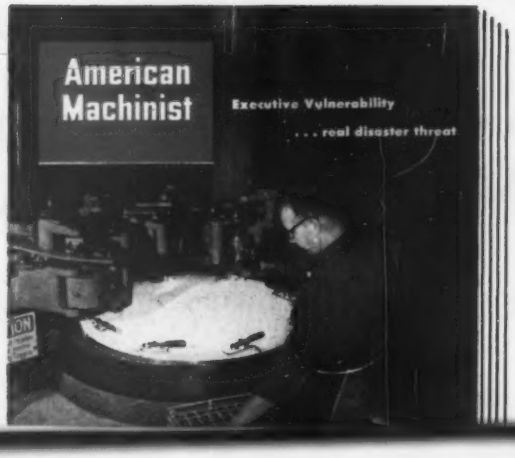
Coming...a 100,000-man advertising in



...the productive

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING,
NEW YORK 36, NEW YORK
MEMBER AUDIT BUREAU OF CIRCULATIONS
AND ASSOCIATED BUSINESS PUBLICATIONS
PUBLISHED EVERY OTHER MONDAY

ABC ABP



demonstration of why American Machinist PAYS

From every state in the nation, over 100,000* metalworking men will head for Chicago next September. As they do so, history's biggest gathering of production men will demonstrate *why* advertising in *American Machinist* is so sound and sensible an investment.

These metalworking men have just one purpose in going to Chicago: to see and compare, and often to buy right then and there, the cost-cutting, production-boosting machinery and equipment for which *American Machinist* every year carries more advertising than any other magazine in the world.

Chicago next September will witness a new industrial phenomenon. In addition to the biggest industrial exposition of them all . . . the first Machine Tool Show since 1947 . . . two other concurrent machinery and equipment expositions compete simultaneously for the interest and attention of one group of industrial buyers: *Metalworking's production engineers and executives.* And for the first time in history, over 100,000 decision-making men, with major buying responsibility in their industry, will be on hand to see, listen, and be sold.

Thus do metalworking production's SUPPLIERS and metalworking production's BUYERS offer an unique demonstration of the sound purpose, and tremendous advertising values, of a business magazine:

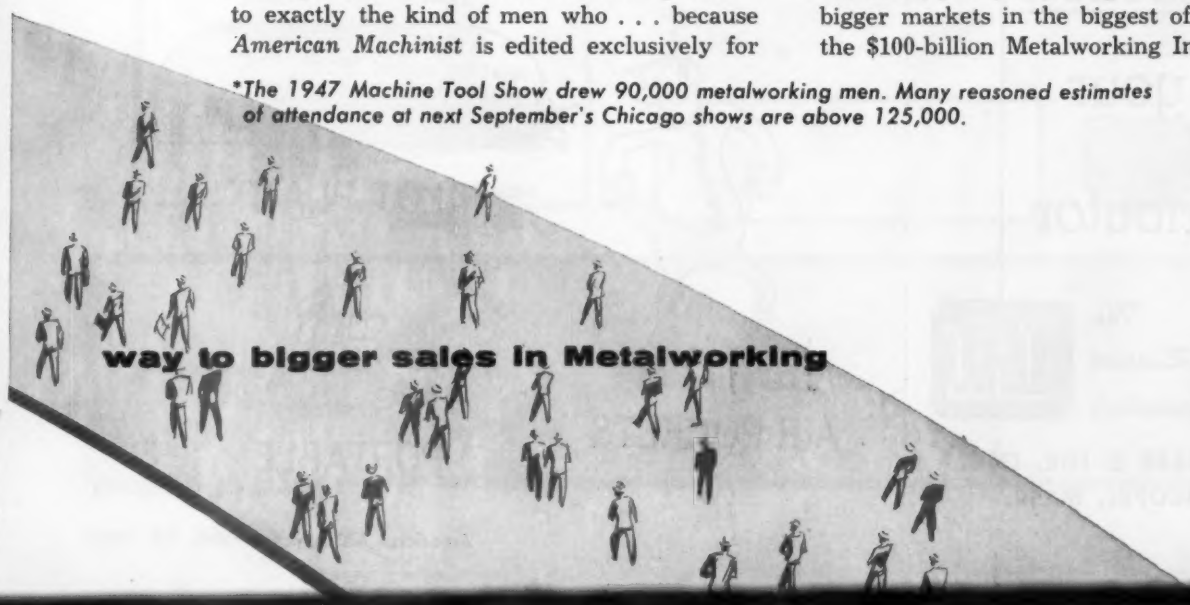
Next September's Chicago exhibitors are investing record millions to show their products to exactly the kind of men who . . . because *American Machinist* is edited exclusively for them, and is more helpful to them than any other magazine . . . subscribe to it in record numbers. Far more production-responsible metalworking engineers and executives subscribe to *American Machinist* than to any other metalworking magazine, and the number grows bigger every month.

In their turn, Metalworking's production engineers and executives will next September set new standards of interest in being "shown and sold," when over 100,000 of them invest their time and money to go and see what's new and better in the products Metalworking can buy and profitably use. The kind of men who read *American Machinist* are *new-equipment minded.* Theirs is a fast-growing industry . . . and one that now estimates it will invest at least $10.9-billion for new plant and equipment in the next four years alone.

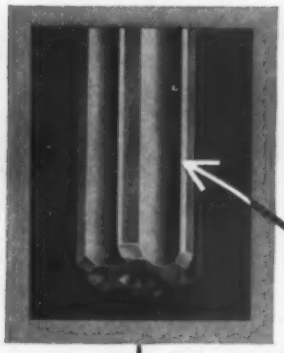
Add up the facts, and surely they tell you this:

Metalworking's production engineers and executives are a vital buying force, with a strong voice in the purchase of every product that is used or consumed in this giant industry's production operations. To sell Metalworking, you *must* sell Production, and every month *American Machinist's* advertising pages can put you in touch with more metalworking-production subscribers than any metalworking magazine has ever before delivered. When you concentrate your advertising here, you concentrate it where 950 sales-minded companies, manufacturing a wide variety of production machinery, materials, parts, and components, are building bigger markets in the biggest of them all . . . the $100-billion Metalworking Industry.

**The 1947 Machine Tool Show drew 90,000 metalworking men. Many reasoned estimates of attendance at next September's Chicago shows are above 125,000.*



way to bigger sales in Metalworking



This edge cuts reaming costs

L+I gives you the edge on production

Call your L+I distributor

The Reamer Specialists

L&I

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

A Matter of Balance

Some time ago, your Detroit editor made a remark about a V-6 engine lacking balance. That, Sir, is just what it *would* have. True, the firing would be irregularly spaced through the cycle. But it actually would have better inherent balance than a V-8. That's what counts. It would be easier and cheaper to make into a "smooth" motor. The irregular firing has little to do with this. Any odd number of cylinders in a bank gives better dynamic balance than any even number, such as 2, 4, or in-line 8. It is for similar reasons that radial aircraft engines usually have an odd number of cylinders.

This is easily proved mathematically by elementary theoretical mechanics, as learned by sophomores. And the truth is suggested by comparing the crankshaft of an old "Chevvy 6" with that of an old Ford 8. The latter required considerable machining to accomplish the balance easily obtained in the Chevvy. Apart from rubbing surfaces, the Chevvy shaft was a rough forging. It could be. Its motor was really a pair of 3-cylinder jobs.

If they could get around the mental inertia in Detroit, they'd save a lot of dough and produce a better balanced engine if they did make a V-6. But it would be still cheaper, and still better, if they would make an in-line 5. This would have inherent balance, mathematically and practically provable to be superior not only to a V-8, but to a V-16, or even a V-12. Moreover, firing would be regularly spaced throughout the cycle.

Lew Suverkrop
Bakersfield, Calif

Talking of Tenths

Now that measurements in "tenths" and even "millionths" are becoming so common and necessary, isn't it high time that printers and editors do the reader the courtesy of eliminating the need for counting digits every time he encounters such figures in print?

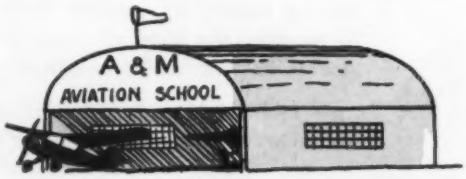
It's easy enough to see that 0.006 means six thousandths. But beyond that, it takes time. Figures such as 0.0006, 0.00006, and 0.000006 confuse the eye. If we used an intermediate comma thus: 0.000,6; 0.000,06; and 0.000,006, it would be seen immediately that we were indicating six tenths, sixty millionths, and six millionths. Six ten-millionths would be rendered as 0.000,000,6.

Needless to say, figures for trigo-

GRINETICS

By D G SMITH

AIR POCKETS

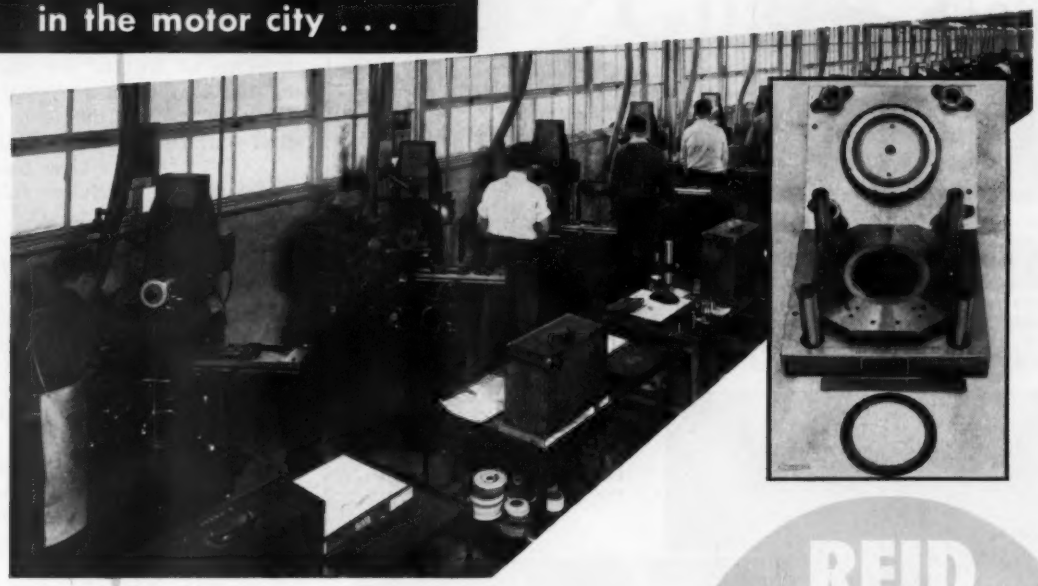


PILOT PLANT

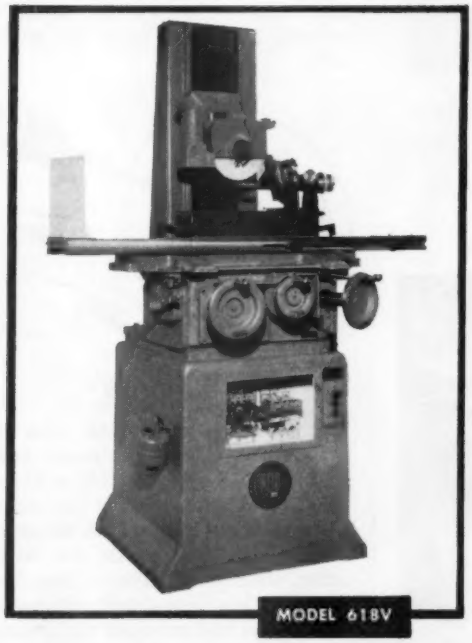
PORTABLE

Republication rights reserved.

in the motor city . . .



REID GRINDERS set the STANDARD for ACCURACY



In Detroit, at Commando Tool and Die Co., positive accuracy is a must in grinding the high-production tooling necessary for today's automobile and aircraft production race. Commando and many other shops in the area have found that Reid Surface Grinders provide the built-in accuracy that spells top performance year after year.

You, too, can have the precision, the better surface finishes, the dependability and convenience of operation that are engineered into every Reid Grinder. So why not plan now to replace the over-age surface grinders in your plant with new Reid Grinders.

Complete details are contained in Brochure 618-1 — request your copy today.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

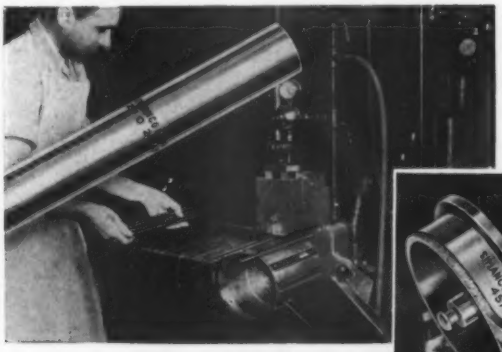
LEADERS IN INDUSTRY MARK WITH NOBLEWEST

How Singer marks best with Noblewest

For nearly half a century, Noblewest has been supply leaders of industry—such as the Singer Manufacturing Company—with precision marking equipment. Singer uses every basic type of Noblewest Roll-O-Matic marking machine to permanently roll-in inscription markings. For faster, money-saving marking in your plant, contact Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Connecticut.

← **SERIES 50** — Noblewest general purpose marking machine with full pneumatic operation. Can be tooled for marking flat and round surfaces, for precision graduating and for serial numbering with Noblewest automatic numbering heads.

SERIES 20—This rapid precision marking machine will permanently mark up to 5,000 pieces per hour. Ideal for parts that will stand up and rotate on the carrier dial. Three interchangeable pressure dials mark approximately 50 different parts on this one Noblewest machine. →



← **SERIES 19** — Has production of 6,000 pieces per hour. The die holder on this model has automatic pressure compensator for insuring uniform depth of markings regardless of slight variation of part sizes.

SERIES 21—A Noblewest rapid production marking machine with a capacity of 2500 to 3500 pieces per hour. Ideal for parts on which markings must be accurately positioned. ←

MARK IT BEST WITH

NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

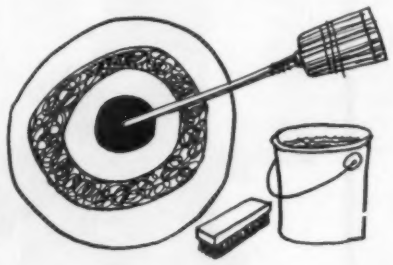
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

nometric functions would be continued without commas because they are read differently, as a series of digits, and are so thought of and considered. But not so decimal expressions of length. We read them and think of them as "tenths," etc. Why not try out the idea and see what your readers think of it.

Lew Suverkrop
Bakersfield, Calif

The idea strikes us as eminently sound and practical. How often has a machinist made a mistake by miscounting the number of zeros? We've done it ourselves, too, when the printer miscounted and we followed suit in checking proofs. The human eye seems incapable of picking up so many zeros at once, and one can never be sure without checking them off with a pencil and counting, thousandths, ten thousandths, hundred thousandths, millionths. About the only improvement we can suggest for the Suverkrop idea is to write 0.000,060, adding the extra zero after 6 for quick reading as 60 millionths, because we try to avoid the danger of confusion by not speaking of hundred thousandths, which may sound like 0.100.

We would appreciate hearing from our readers as to their feelings in this matter. Meanwhile, we'll try running an article using the system. —Ed.



Bullseye

You scored a real point with your little story about the messy stockroom (*AM*—April 11 '55, p161). Of course, all stockrooms should be kept as neat as possible. So should all other working areas. But, all too often, some executive, in his desire for neatness, loses sight of the fact that a certain amount of apparent confusion is actually necessary.

On an erecting floor, for example, there may be jacks, prybars, hunks of scrap wood, chains, washers, bolts, and assorted hardware lying around. It looks messy as the devil, but all those things are for immediate or future use, or have just been used. If the men have to use a jack for ten minutes, then take it back to the

stores right away, then get it out again ten minutes later, they will never get the job finished. Even when they quit at night, it is still OK to leave the things right there for use the next morning. When the job is done, they should clean up, of course, but don't let us forget that even neatness has a point of diminishing returns.

John Horne
Cincinnati

Beware of the Dog

Your article on Soviet machine tools (*AM*—April 11 '55, p118) was most interesting and enlightening. It shows clearly the weakness of their production system.

With all respect to the author, however, I think we should be a little wary about accepting their published figures at their face value. As we all know, the Russians are past masters in the art of propaganda, and it seems quite probable that they are deliberately concealing their strength under a show of apparent weakness. I do not say that this is the case—just that it is a possibility.

In the same issue (p162) you present evidence from the Leipzig fair to show that they are capable of producing top-grade equipment. Is it not possible that their emphasis on lathes and simpler machines, and their lack of grinding equipment, may be the result of a shortage of sufficiently skilled labor? As their training programs progress, this shortage will undoubtedly be overcome.

I do not wish to be an alarmist, but I believe we should keep a careful eye on what they are doing, and not dismiss their efforts too lightly. They represent a real potential threat to our own machine-tool industry from the standpoint of exports. But, more important, they show that they may soon be in a position to produce all they require to carry out their plans for world domination. We must keep on our toes to keep one good jump ahead of them.

Wm R Pratt
Birmingham, Ala.

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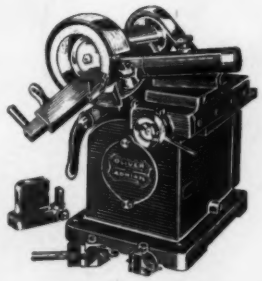

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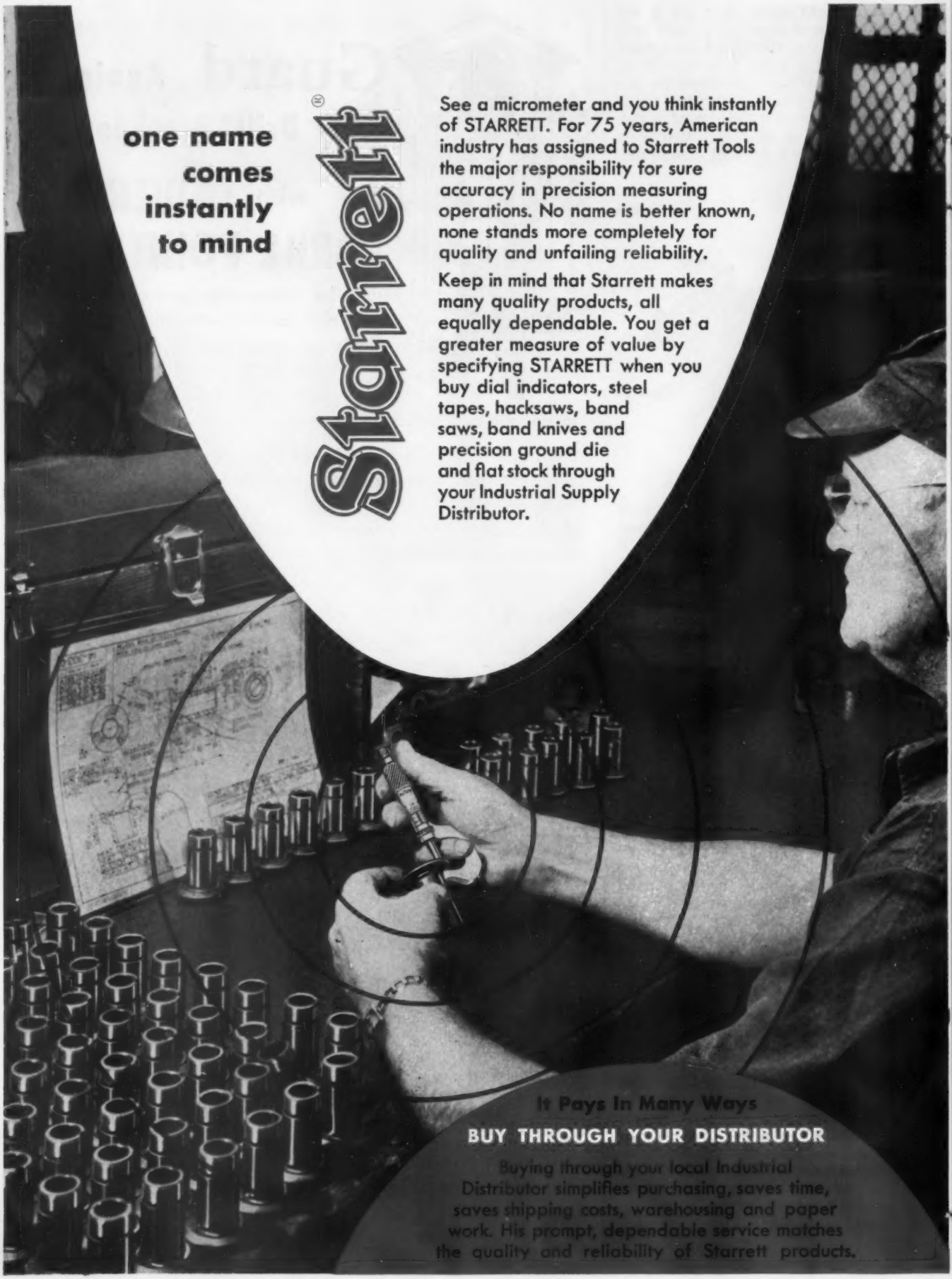
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See a micrometer and you think instantly of STARRETT. For 75 years, American industry has assigned to Starrett Tools the major responsibility for sure accuracy in precision measuring operations. No name is better known, none stands more completely for quality and unfailing reliability.
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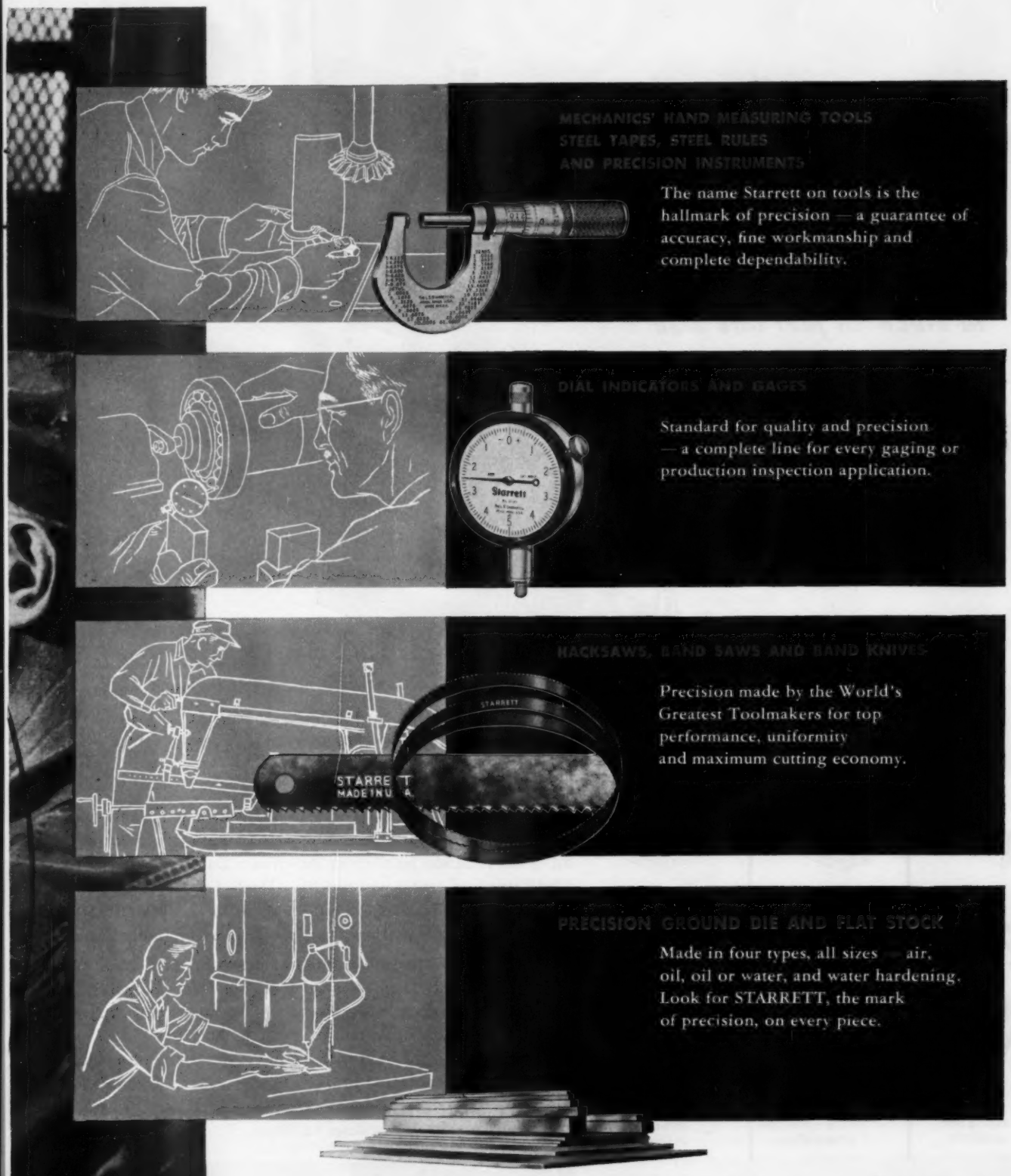
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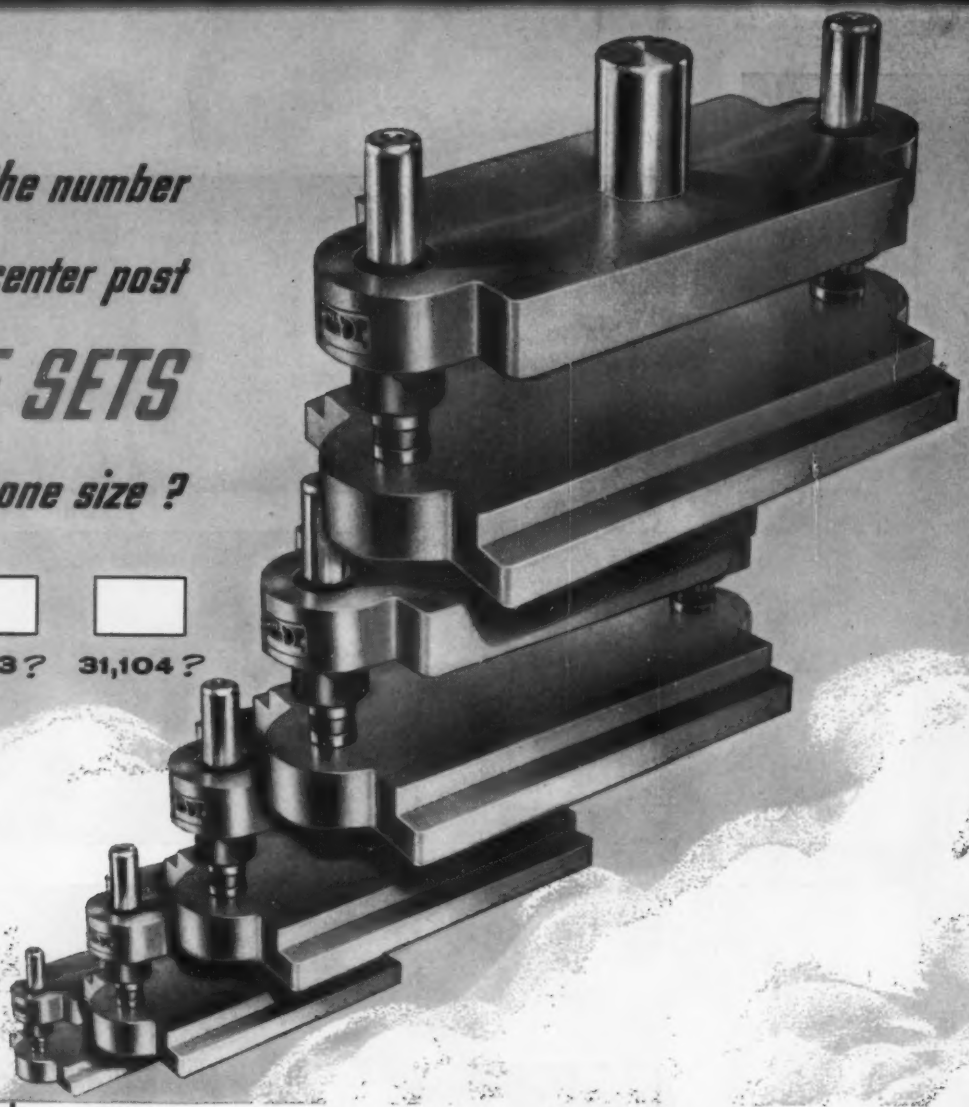
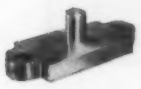
can you guess the number of different center post

DANLY DIE SETS

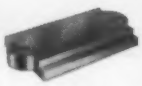
in stock–in just one size ?

67 ? 575 ? 1433 ? 31,104 ?

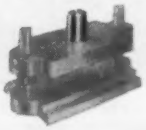




3 different punch holder thicknesses

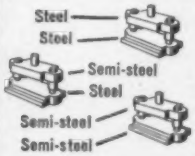


3 different die shoe thicknesses



6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of 3 different styles to choose from

If you guessed 31,104 different standard center post Danly Die Sets in just one size . . . then you were right! Simply multiply together all of the variation possibilities shown in a Danly Catalog for a 12x12 standard center post precision Danly Die Set, and you'll get this remarkable figure. Even more remarkable is the fact that *all* of these variations are cataloged and *stocked* in every Danly Branch.

Just how does this benefit you? This almost unlimited variety of Standard Danly Die Sets in stock at your Danly Branch is your assurance that you can always get the die set you want . . . *when* you want it. That's important in saving tooling time. So remember, when you want the best in die sets—*fast*—the place to call is your local Danly Branch.

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DANLY

DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

Spot News of Metalworking . . .

All-titanium 20mm cannon cartridge made of metal powder was shown for first time at Metal Powder Association's annual meeting. Cartridge is completed in seven steps by Brush Laboratories, starting with high-density blank of Ti hot pressed from powder. Six pressings, each followed by an anneal, complete the final shape. (More details on powder metal on p149 and p178).

General Motors wants in its machine tools these things, among others: (1) Nonflammable fluids in hydraulic systems to avoid fires, regardless of technical problems involved, (2) automatic sizing, (3) ease of maintenance, which is listed by 34% of GM master mechanics as the No 1 need. See p179 for details.

Pentagon plans to spend $400 million for reserve machine tools between now and July 1, 1959. More than $25 million of that amount will be placed with machine tool builders by June 30, 1955. Entire program is spelled out on p 107.

Westinghouse will go right ahead with jet engine development, contrary to rumor, even though its military jet engine contracts will phase out this year.

Pentagon officials say there's a "possibility" that the seven Air Force Heavy Presses cancelled out of the program two years ago as an economy move may be reinstated — if the current program proves successful. And there's every indication it has (see pages 180-181).

Ford has a new engine plant planned for "somewhere in Ohio," but probably not in the Cleveland area. It'll come out of Ford's recently announced three-year, $625-million modernization and expansion program.

Electronics firms are swamped with unprofitable prototype work for the government, but there's little production followup so far. Electronics firms also say they're being drained of their engineering talent by some big airframe makers, who are doing more and more of their own avionics work, and who can afford to pay the engineers more.

Machine tool leasing has spread to Mexico, where a U S firm, Public Service Leasing System Inc, is offering long-term leases at 6-8% interest, much lower than current Mexican rates. Minimum lease order is $200,000.

All TS (tentative standard) stainless steel alloys, designed to conserve such metals as columbium, tantalum, and molybdenum, have been eliminated by the Iron & Steel Institute because of removal of government restrictions on those materials. New, better alloys, containing more of those metals, have been substituted.

Immediate annual cost of the guaranteed annual wage isn't the bone of contention between the UAW and Ford and GM. UAW wants to finance GAW this year with a trust fund based on 4% of payrolls, plus 4% to meet "current liability." The automakers might accept this. But what they're scared of is that they have no assurance UAW wouldn't raise the ante to 10-12% in 1956 and 1957.

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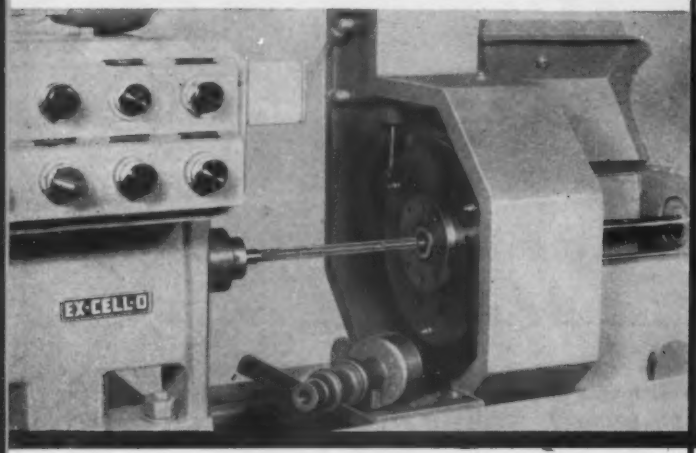
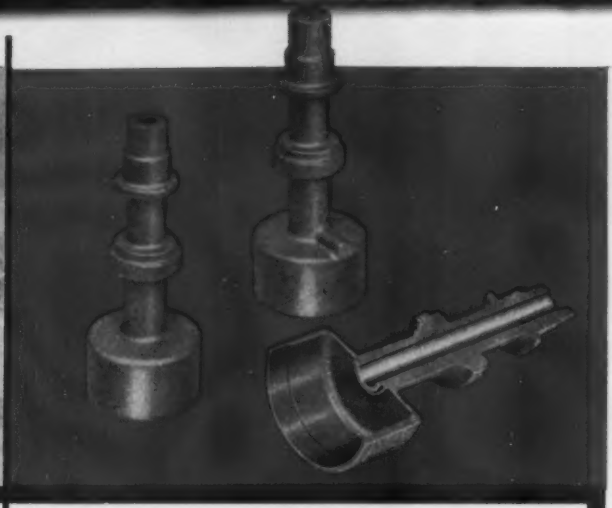


Photo with guards removed shows drill about to enter the guide bushing in the center of the chuck. Coolant oil under high pressure is directed through the spindle and drill, washing chips out of the single flute.



On this cast-iron distributor base, holes are machined straight and round within .0005"; diameter is also held within .0005"; finish does not exceed 15 rms. The hole is completed from start to finish in 30 seconds.

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EX-CELL-O for PRECISION

Today's method by EX-CELL-O for reducing your costs

BOR-DRIL

for straight, accurate holes from solid with good finish—on standard machines

Equipped to Bor-Dril is this standard Style 2112-A, the smallest single-end model in the Ex-Cell-O Precision Boring Machine line. These machines are rigid, have easily adjustable feeds, vibration-free spindles. Multiple spindle applications for high production.

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55-16

Washington . . .

Plant Security . . .

A Senate subcommittee is considering a bill empowering the government to keep suspected subversives out of strategic defense plants — like machine tool facilities — where no secret projects are under way or no direct military contracts are involved.

The government now has authority to bar security risks from defense plants only if the plant holds a classified military or atomic energy contract. But in the absence of legislation like the proposed bill, the risk of litigation by a discharged employee or his union is placed on industry. The new bill would remove this risk. It would cover any industrial facility rated strategic by the government even if no direct sales to defense agencies are involved. Main examples: electric utilities, railroads, communications facilities, and the like.

Last year, a similar bill was passed by the Senate, then pigeon-holed by the House Judiciary Committee. This year, chances for passage are strong. Both the Pentagon and Justice Dept are pushing vigorously.

Kaiser Gets Heavy Presses . . .

After considerable pulling and hauling, the Air Force has named Kaiser Aluminum Corp to operate the Halethorpe, Md, heavy press plant, which contains two 8000-ton extrusion presses. Kaiser was general contractor for the plant's construction, and appeared to be the likely plant operator. In almost all other cases, the heavy press plants have been built and operated by the same firm.

But earlier this year, Air Force Secretary Talbott invited other firms to bid on contracts to run the Halethorpe plant. In letting the new contract to Kaiser, Talbott said the deal will be "on terms very substantially more favorable to the government than was originally expected."

More Heavy Presses? . . .

By November of this year, each of the Air Force's 10 heavy presses will be in operation. The first complete plant went into operation this month, when Alcoa started production at Cleveland on 35,000-ton and 50,000-ton forging presses (see p180).

Pentagon officials say there is a "possibility" that plans for seven other heavy presses — cancelled two years ago as an economy move — may be reactivated if the current program proves "successful."

Right now, just about 90% of the output from the five heavy presses now in operation is considered "experimental." But the Air Force expects commercial use of the presses to increase. Thirty dies are now being prepared for use next year by the four forging presses operated by Alcoa and Wyman-Gordon.

FTC Hits Auto Parts Makers . . .

Three manufacturers of auto replacement parts— Moog Industries, St Louis; E Edelmann & Co, Chicago; and Whitaker Cable Corp, North Kansas City, Mo — have been ordered by FTC to stop discriminatory pricing practices. FTC ruled the three firms illegally discriminated against some customers and violated the Robinson-Patman act by granting special discounts and rebates to big buyers.

According to FTC charges, Moog used an annual volume rebate plan, allowing rebates as high as 19% to only 407 of 1200 buyers. Whitaker Cable granted 17½% discounts to jobbers buying over $3000, nothing to ones with orders less than $600. In addition, jobbers who participated in a group-buying scheme received as much as 20% off list prices. Edelmann gave a 15 to 20% discount to 40 of 3500 jobber customers who ordered through cooperative buying groups.

Guaranteed Annual Wage . . .

Sen Lehman has introduced a bill revamping the guaranteed annual wage provision of the Minimum Wage Law. As it stands now, a firm that guarantees 52 weeks of 40-hr paychecks has to pay overtime only after 12 hours a day and 56 hours a week. Lehman's bill would trim overtime-exempted hours to 10 a day and 48 a week.

Hormel & Co, meatpackers, have jumped on the bill. The firm has a highly-touted system now which guarantees an annual wage through overtime work. It's been in effect for 20 years. The company works employees hard during the peak livestock season— including a number of 12-hour days and 53-hour weeks—but so far never up to 56 hours. Then in the summer slack season, Hormel employees work three and four day weeks.

Hormel claims it needs this elasticity to make the GAW plan work. The firm likes the plan, says most employees averaged 33.4 hours a week last year.

Metalworking Labor "Unity" . . .

Delegates from the AFL-Machinists, CIO Auto Workers, CIO Electrical Workers, and CIO Steelworkers, representing 40,000 Bendix Aircraft employees in 21 plants, met in Washington to "discuss common bargaining objectives of the four unions." It was probably the first meeting of four unions having contracts with one major company. Labor people cited the meeting as putting "labor's new unity into actual practice" while the CIO and AFL are drafting a new constitution for a merged U S labor movement.

An interim study group of representatives from the four Bendix unions was set up. Its function: to "coordinate bargaining objectives" of the four groups. The IAM delegate said his union will back UAW's drive for a guaranteed annual wage.

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Production men like WRIGHT HOISTS because they're built to "take it!"

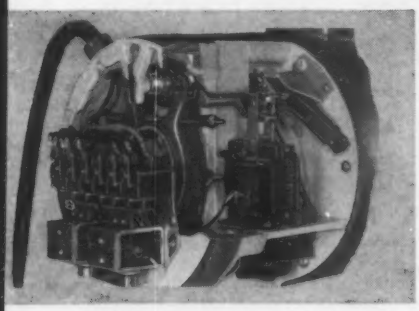
Wright Frame 1
Speedway
¼ to 1-ton

• Tough jobs demand tough tools. WRIGHT's heavy duty design, choice of superior components and perfectly balanced assembly make these hoists first choice of production men. You can count on them for your most critical material-handling jobs. Avoid "down time." Buy WRIGHT and be sure.

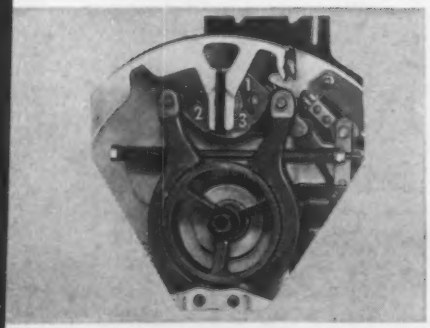
Superior long-life performance is a "dividend" production men have learned to expect from WRIGHT *Speedway* Hoists. This day-in, day-out trouble-free operation is built in at the WRIGHT factory.

Get the full WRIGHT story. A new booklet, **#DH-133B**, will show you how the new Model WRIGHT *Speedway* Frame 1 Hoists will handle tough jobs on any duty cycle for which 1½ HP, 30 minute NEMA motors are satisfactory. Compare the time-tested structural, electrical, and mechanical features and know why these hoists are favored by production men.

Maintenance requirements are simple and easy



Easiest to get at



Nothing to adjust but the cam!

• WRIGHT hoists are built right and properly adjusted at the factory. Only maintenance usually required is occasional compensation for brake lining wear.

This adjustment on the new *Speedways* is unusually simple as the photographs show. Loosening and removing a few screws allows the end housing and side cover to be removed. The cam settings which may be changed to compensate for brake lining wear are pre-determined and numbered. There is no guess work and the cam adjustment is the only one required. The long, calibrated compression springs and the solenoid are factory set —NEVER need adjustment for brake lining wear.

Write for this Booklet

Write our York, Pa., office for this New Booklet, **#DH-133B**. It describes the many electrical, mechanical, and structural features that make the new WRIGHT *Speedway* Electric Hoists, Frame 1 and 1½ (500 to 4000 lb. capacities) ideal for both production *and* maintenance men.

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Hoists
Trolleys
Cranes

Detroit . . .

Another Big Michigan War Plant . . .

. . . will go commercial this month. Fisher Body's huge (over 1-million sq ft) Grand Blanc tank plant phased out production of M-48 Patton tanks on May 19. Modification of completed tanks, now in storage near the plant, will continue until early fall. Fisher will convert the plant to stamping operations to serve, mainly, Chevrolet and Buick. Grand Blanc will be the GM Division's eighth stamping plant. Employment has been averaging about 3000.

About 3500 government-owned machines and over 7000 special fixtures and tools will be made ready for layaway. A dehumidified storage building, on which construction has not yet begun but for which appropriations have been approved, will be built adjacent to the 352-acre Grand Blanc site. There, the government equipment will be mothballed, as was done at Ford's Livonia plant. In the meantime, that equipment which can withstand exposure to the weather will be set out on hard stands. Other equipment will be stored inside the Fisher plant until the government storage building is completed.

Sources differ in estimating the total value of contracts processed by Grand Blanc since it began production. One source says the eventual contract value will have amounted to about $575 million, while another says upward of $750 million in defense contracts will have been filled.

GM lost out to Chrysler last fall in its bid for continued M-48 production. Chrysler's bid of $160.6 million to build the tanks in its Newark, Del, plant was about $7.6 million under the GM bid.

Interestingly, GM's net unfilled defense orders have decreased in value by a sort of "arithmetical retrogression" since early 1953.

Net unfilled orders on January 1, 1953, totaled $3.3 billion; at the end of 1953, they amounted to $2.2 billion; at the end of last year, the total had fallen to $1.1 billion. Its defense sales in the first quarter of 1955 totaled $289 million, compared to $391 million in the first three months of 1954.

The Nimble Rambler . . .

. . . seems sure to shove its big brothers in the American Motors family out of the driver's seat. Already accounting for about half of total AMC production (Nash, Hudson, Rambler, Nash-Healy and Metropolitan), the smaller line is set to show off definitely major styling changes in 1956, while the bigger Nash and Hudson models will be facelifted only. (Among other nameplates programming big alterations in the 1956 offerings: Olds, Cadillac, Lincoln, Buick.)

Lifespan of the midget Metro, rather in doubt for a while, now is assured for at least another year. AMC has ordered an additional 20,000 units from Austin Motor Co Ltd, England. This duplicates AMC's initial order.

If You Worked For Buick . . .

. . . you'd have a hard time keeping a grin off your face these days. Reason: the division is still locked on to the coveted third place position in industry sales, and according to Ivan Wiles, Buick general manager, sold more than one (11.1%) out of every 10 new cars sold in the first three months. Wiles said that the Flint producer registered 171,537 cars in the quarter—15,886 units ahead of Plymouth.

In an unwary moment, Buick executives might be inclined to admit that even they are a little surprised by their continued leadership over Plymouth (which Buick displaced handily in 1954.) Last fall, spokesmen were confessing that if the car market should be strong enough to warrant all-out production on the part of all producers, Buick could not hope to maintain the pace Plymouth would be able to set. That thinking was probably based on a belief that Plymouth's current expansion program would give it the added productive muscle needed to whip Buick. Such is not the case—yet. Plymouth's expansion will not be completed in time to assure it undisputed production leadership this year. Moreover, it has been plagued by an inability to churn out as many V-8's as buyers are demanding, while at the same time declining to take delivery of all the available Plymouth sixes.

Buick gradually has narrowed Plymouth's lead in output to the point where the latter is in front by less than a scant 3000 units.

Wiles made a point of showing where a lot of his new customers are coming from. In February, 64% of the trade-ins for Buick specials came from competitive makes, and a third of that total was made up of Chevrolets, Fords and Plymouths. Some idea of the increasing ability of consumers to "buy up" comes when you compare the price ranges covered by the two makes. Buick's lowest advertised delivered price, exclusive of optional items and state and local taxes, is roughly $2232, and its highest, $3550. The Plymouth range, roughly: $1638 to $2425.

If You Buy A Car . . .

. . . that will be built after July 4, you'll be getting much more effective headlamps than those presently being used. As of that date, all automakers will begin installing as original equipment the new lamps which were developed cooperatively over a four-year period by the auto and headlamp industries. The new lamps "trap" or shield stray upward light rays; most notable improvement is the added visibility afforded during adverse weather.

5409

SHORT RUNS of PRECISION GEARS

Short runs of small, fine pitch, precision gears (gears up to 6" O.D. of the gear blank) carry high unit costs largely because of the top-heavy machine set-up time as compared to total production time. You can beat the machine set-up problem by routing small precision gear jobs to Hamilton Precision Gear Hobbers . . . for:

"Hamilton Precision Gear Hobbers feature independent selection of speed, feed, and indexing; reducing machine set-up time and offering a selection of cutting speeds and feeds to suit (exactly) the material being worked."

if you buy small quantities of precision gears, tell the man to "put your job on a Hamilton." You stand to profit two ways!

WANT FACTS?

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IT'S A **Hamilton Tool**

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Machine Tools . . .

Pentagon to spend $400 million for tools . . .

Pentagon has a "currently determined reserve machine tool program" totaling about $400 million.

The House appropriations committee uncorked this information last week.

$100 million of that amount is in the fiscal 1955 budget (year ending next June 30). The House committee has okayed a second $100 million for fiscal 1956.

Pentagon is expected to request $200 million more for fiscal 1957 (beginning July 1, 1956) with the understanding that the money will be spent in fiscal 1958 as well as 1957.

Air Force to spend $15 million by July . . .

The status of the $100 million for fiscal 1955 is: The Air Force will place orders for $15 million by July 1 of this year and will obligate another $69 million by December 31.

Of the $84 million allocated to the Air Force, $40 million will go for reserve machines for airframe makers, $38 million for engine builders, and $6 million for strut manufacturers.

The Navy, with $14.2 million at its disposal, has ordered $2.1 million of machine tools and will place an added $7.6 million by June 30. The remaining $4.5 million will be committed by the year's end.

Some $6.3 million of the Navy's reserve machines will be set aside for ordnance and related manufacturers, $5.5 million for aircraft, and $2.4 million for shipbuilding.

Most of the Navy's funds not placed by June 30 will be earmarked for miniature lathes and other tools for production of VT fuses. These machines will be bought mostly in Switzerland. This part of the program has been held up pending a new review by the Bureau of the Budget.

Around $40 million of the fiscal 1955 program will go to "small" machine tool builders, Thomas Pike, assistant secretary of defense, states.

Five different types of machine tools — skin mills, spar mills, profilers, horizontal boring mills, stretch presses — have been classified in the Air Force program. These machines will not be bought on the lowest-bid basis, Ralph Baldenhofer, director Metalworking Equipment Division BDSA, reported at the NMBTA spring meeting.

Untried or unproved equipment cannot be purchased, since the tools are to go into storage.

Action expected on components program . . .

Mr Baldenhofer said that favorable action will be taken on the marine turbine and reduction gear components program within a few weeks, after Dr Flemming, ODM administrator, has restated the case to Congress.

About $45 million will be spent for machine tools and $19 million for plant facilities for this program.

The elephant tool program, involving $72 million of long-lead-time machines, is on Dr Flemming's desk for final action. BDSA has recommended, Mr Baldenhofer said, that Borrowing Authority money of ODM be used to finance the program without delay.

A fourth program, based on over-all machine tool requirements of the armed forces and of a portion of defense-supporting industries on M-Day, would take $1.8 billion of machine tools, Mr Baldenhofer stated.

BDSA's Metalworking Equipment Division has concentrated on this program the past six months.

It is not BDSA's intention to try to push all of this program immediately, Mr Baldenhofer asserted. Some of it should be acted upon right away, and a further look taken at the situation in about one year.

Machine tool import ratio rises . . .

Machine tool imports in the fourth quarter of 1954 were 3.5% of domestic shipments. The ratio was up a little each quarter of last year from the previous quarter. Total imports in '54 were $23 million, or 2.8% of domestic shipments. So reported Everett Hicks, NMTBA government relations committee chairman and vice president and manager Grinding Machine Division Norton Co, at the NMTBA spring meeting.

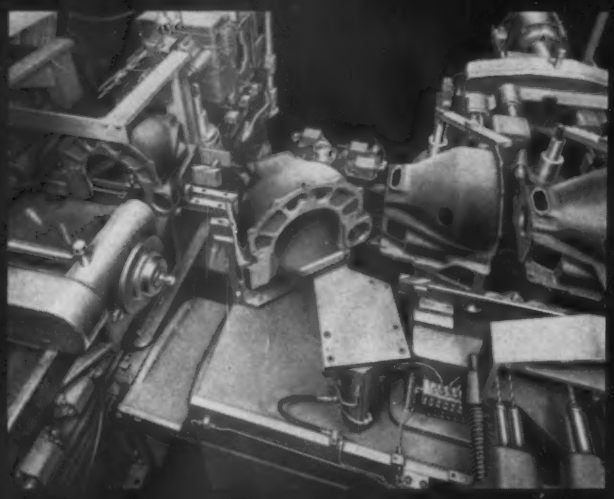
Value of imports in 1954 was 10 times the amount in 1950. Highest import volume was $48 million in 1952, when ratio was 4.8% of domestic shipments.

The present tariff of 15% on most machine tools is not enough, in Mr Hicks' opinion, to equalize the cost differentials between manufacture in U.S. and in foreign countries.

NMTBA representatives have not debated the merits of the Reciprocal Trade Act, but concentrated instead on the need for preventing damage from low-priced imports to industries essential to US defense.

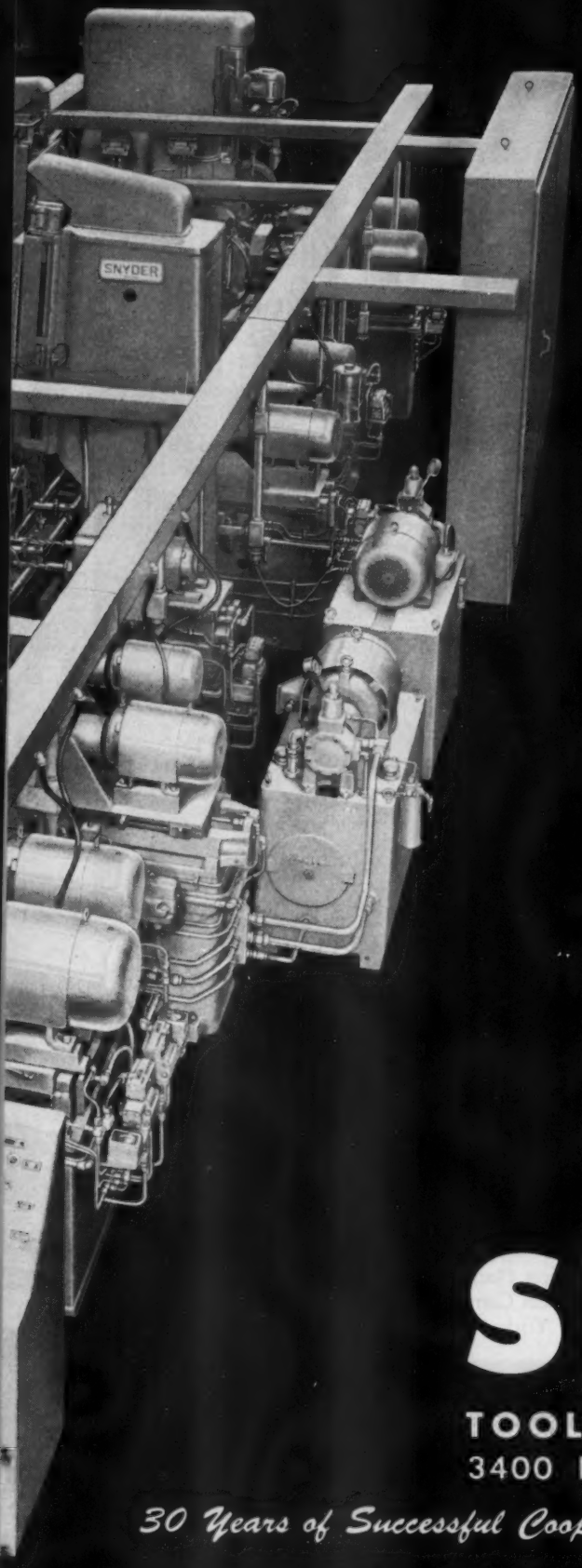
Germany has eliminated quota restrictions on imports of American machine tools, Mr Hicks said. Sweden requires no import license now. Licenses are easier to get in Denmark, Belgium, Luxembourg and the Netherlands, which now issue import licenses for machine tools automatically.

SNYDER—AUTOMATION



At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

LEADER FOR 30 YEARS



Presents

SNYDER SPECIAL

22-STATION automatic transfer machine for processing cast iron clutch housings; which drills, rough and finish bores, mills, saws, taps, spot-faces, counterbores and chamfers, performing a total of 110 operations on various surfaces or holes of various dimensions. Production, 124 cycles an hour at 80% efficiency.

UNUSUAL FEATURES: At Station 1, a 2" breather hole is trepanned from solid metal and finish bored with one tool. At Stations 8 and 9, a section of transfer rails cam-linked to milling units, drops to bring work piece into line with cutters. At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

SNYDER

TOOL & ENGINEERING COMPANY
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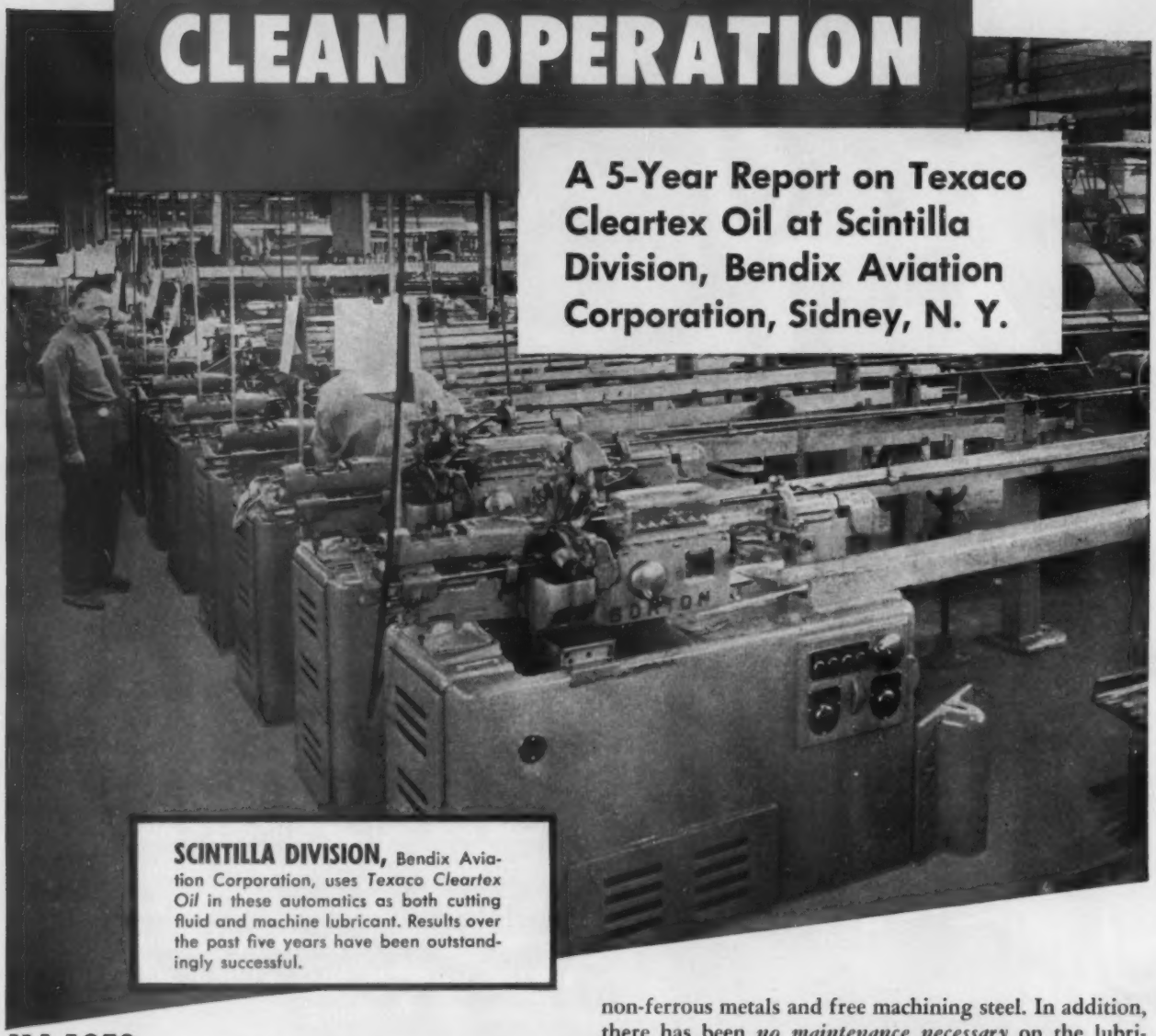
30 Years of Successful Cooperation with Leading American Industries

LONG TOOL LIFE— CLEAN OPERATION

A 5-Year Report on Texaco Cleartex Oil at Scintilla Division, Bendix Aviation Corporation, Sidney, N. Y.



SCINTILLA DIVISION, Bendix Aviation Corporation, uses *Texaco Cleartex Oil* in these automatics as both cutting fluid and machine lubricant. Results over the past five years have been outstandingly successful.

IN 1950, a few months after *Texaco Cleartex Oil* went into use on this battery of automatics, the following benefits were noted: 1) drills lasted twice as long; 2) uniform hole size was maintained; 3) staining of copper was eliminated; and 4) lubrication expense was reduced because *Texaco Cleartex Oil* serves as both cutting fluid and machine lubricant.

TODAY, Mr. Ray Beames, Supervisor, has this to report: "These benefits are still continuing. *Texaco Cleartex Oil* has solved many of our cutting problems on non-ferrous metals and free machining steel. In addition, there has been *no maintenance necessary* on the lubricating sides of the machines."

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all types of machining better, faster and at lower cost. A Texaco Lubrication Engineer specializing in this field will gladly recommend the proper ones for your jobs.

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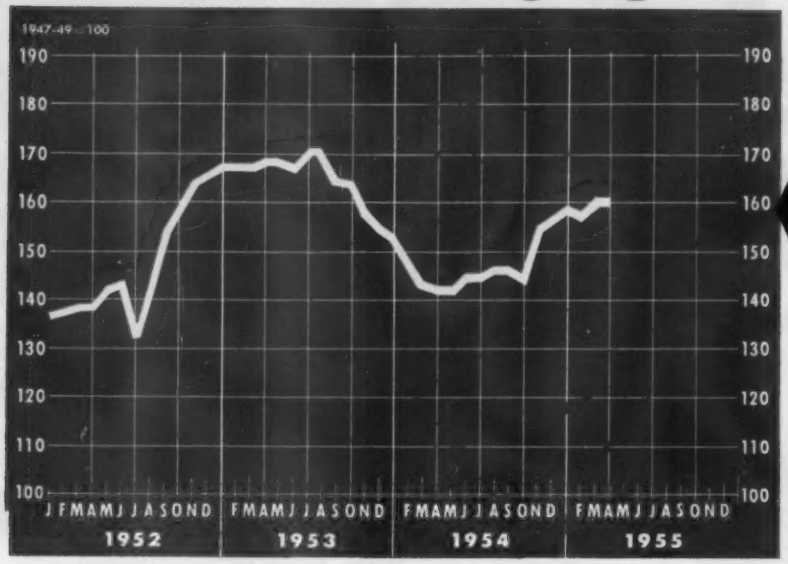
TUNE IN . . . TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on television . . . Saturday nights, NBC.

Gaging Metalworking . . .



Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total index	**160**	**159**	**157**	**147**
Machinery	**127**	**125**	**126**	
Electrical Machinery	**186**	**187**	**163**	
Autos	**160**	**152**	**116**	
Other Transportation	**270**	**273**	**267**	
Other Metalworking	**130**	**129**	**123**	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

Business good all over . . .

Metalworking production shows no signs of slowing down from its near-record pace as midyear approaches. The situation is remarkable in one respect: Business is very strong in almost all segments of the metalworking industries.

Industrial products are just as much in demand as consumer items. Machine tool orders have been consistently good since December 1. And prospects are bright. Cutting tool manufacturers have done well too, with bookings considerably ahead of those a year ago.

Both machine tool and cutting tool people have had to step up production.

Demand strong for durable goods . . .

Other evidences of strength in durable goods: 1) Portable power tool sales are reported up 20% or more from the 1954 level; 2) Orders for industrial furnaces and ovens have been running 60% better than last year, and even higher in induction and dielectric heating equipment.

The contract tool and die industry's backlogs have increased month by month for the past three months. More than that, employment in tool and die shops is up for the first time in a year.

Shop owners view the outlook more optimistically than at any time in months.

Railroads doing more buying . . .

Even the railroads are doing more buying, and they have been the worst laggards of all. The steel castings makers say that production is close to 100%, thanks to a notable improvement in orders from the railroads. Historically, about 35% of steel castings business originates with rail carriers.

Stamping plants are doing all right too. Piled-up orders are some 20% better than a year ago and are equal to 11-weeks' work. Best guess for the year: An increase in shipments of 5-10% over 1954.

Some of the recent heavy orders for durable goods can be chalked up to the desire of customers to place requirements before price increases take effect. For the fact is that prices of industrial products are going up.

Price increases drive in business . . .

Many companies admit that bookings the past few months, stimulated by coming price advances, have been at the expense of volume later in the year.

Die-castings sales have been climbing rapidly. Production rates are high for customers in such lines as electric appliances, plumbing goods, industrial machinery, cameras, various kinds of hard goods.

There is no sign of any letdown in automobile output, despite the fact that dealers' stocks are the largest in history. Auto parts companies have no hint of a drop in weekly deliveries to the Big Three.

Some parts manufacturers predict that the current level will hold through August.

Home and industrial construction continues to provide much stimulus to a wide variety of metal products.

Steel demand shows no abatement. Sheet and strip, as usual, are the tightest items. Mill rollings for the third quarter are being scheduled at a good rate.

Alloy steel sales have been sizably better than last year. But mills look for a decline this summer.

Gaging Business . . .

Price Index

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total Index	**134.5**	**134.3**	**134.2**	**132.8**
Metalworking Machinery	**146.1**	**145.9**	**142.0**	
Other Machinery exc. Electrical	**139.0**	**138.8**	**137.6**	
Electrical Machinery	**131.9**	**131.9**	**132.0**	
Fabricated Metal Products	**130.5**	**130.5**	**129.0**	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

Outlook bright for second half . . .

Things look good in business and industry during the remainder of this year. Little if any recession is likely after midyear.

Much of the boom thus far in 1955 has been sparked by the automobile industry's extraordinary record. **In view of this fact,** there is some apprehension about the effect upon the economy of a drop-off in motor car production later in the year.

Best information on this point is this: At the worst, the disparity between car assemblies the first half of the year and the second half will be 60%-40%. It may be a little better, say 58%-42%. But the difference promises to be sharper than normal (which is about 55%-45%).

Third quarter to be low point . . .

The dip will be mostly in the third quarter. That is when Detroit will be preoccupied with retooling plants for 1956 model production and when actual output will be at low ebb.

Even so, it would be surprising if the Federal Reserve Index of industrial production declined more than 8-9 points. In any event, the index probably will be back up in the final quarter to about today's level of 135.

The feeling is that the resurgence of spending for new plant and equipment, as forecast by the McGraw-Hill Department of Economics survey, will offset declines in homebuilding and other lines.

Prices of industrial products up . . .

Higher prices for industrial products appear to be in the cards. Important wage increases are on the way. These gains will be large enough to force some upward revision of prices.

For two years, hourly rates have risen about five cents an hour each year. This year, the increase will be closer to ten cents an hour.

The pickup in labor rates will be far more than the normal increase in productivity would permit industry to absorb. Productivity has been moving up about 3% a year; a ten-cent-an-hour hike in wages is equivalent to around 5%.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	142.6	142.6	123.3
Steel ingot production (thousands of tons)	2,334	2,331	1,690
Electric power output (million Kilowatt hours)	9,586	9,699	8,438
Production of automobiles and trucks	220,961	231,021	154,640
Engineering construction awards (*Eng. News-Record*—millions)	$458.7	$389.4	$344.0

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	339	382	344
Vacuum cleaners sales (thousands of units)	263	250	221
Washers sales (thousands of units)	353	357	250
Household electric ranges sales (thousands of units)	127	137	102
Radio production (thousands of units)	1,090	1,068	872
Television production (thousands of units)	703	655	421
Gear sales index (1947-1949 = 100)	148.5	140.2	167.4
Foundry equipment new orders index (shipments, 1947-1949 = 100)	90.4	81.0	173.8

*Seasonally adjusted

T-J SPEED

IN RIVETING and CLINCHING REDUCES LABOR COSTS!

T-J RIVITOR . . .
8″ throat . . . feeds and sets rivets with special 10 station indexing fixture. Has air operated hold down mechanism and special air circuit to provide automatic indexing.

T-J CLINCHOR . . .
one of six special 8″ throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets square cased nuts in outside quarter panels, left and right hand.

AUTOMATIC FEEDING AND SETTING

More and more . . . T-J Rivitors and Clinchors meet today's demands for faster assembly on a wide range of jobs . . . in aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8″ to 36″.

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞″ long. Air-powered sets aluminum alloy rivets or steel rivets up to ¾″ long. Throat depths 8″ to 36″.

Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

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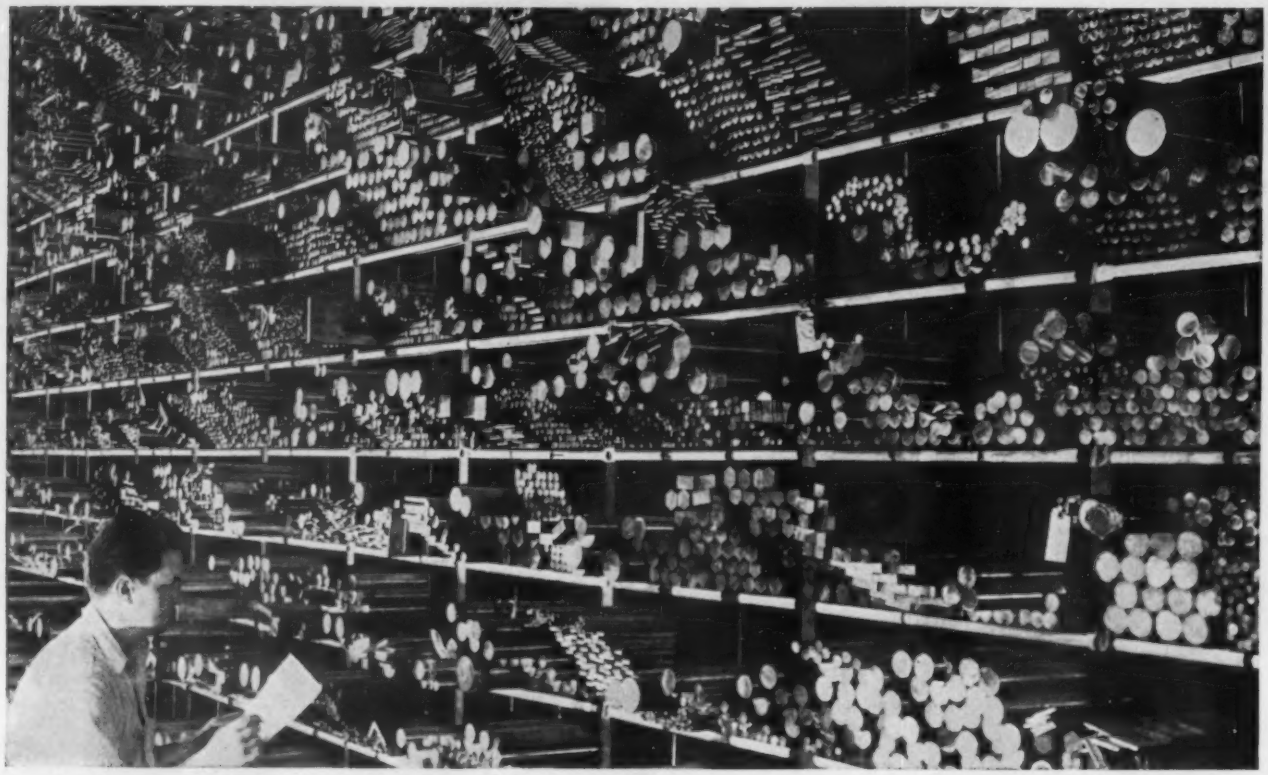
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

38 YEARS EXPERIENCE



Here's a STAINLESS "DEPOSIT" that You Can Draw on

Here's stainless steel bar stock ready for your instructions. It's just part of Armco's mill "bank" of finished products. When you can use stock that's on the racks, there's no waiting for the rolling of your order. It's ready now! Just tell us what you need and how you want it shipped.

SEMI-FINISHED STOCK TOO

In addition to finished bar and wire stock, Armco carries a large inventory of semi-finished stainless steel. These blooms, billets and rods are kept for quick conversion into standard and special sizes and shapes.

ALL STANDARD TYPES

Armco produces all standard analyses of stainless steel and special types in a wide range of sizes, forms and finishes. In free-machining types alone there are 11 different bar and wire grades. No other single plant can ship you stainless bars and wire in as wide a range of analyses, forms and conditions.

WHY HOLD UP PRODUCTION?

If you have reasonable quantities of stainless parts to make, we can probably supply you all the bars you need from stock. If your needs are large let us start you out with a stock shipment and follow with a rolling order—so there will be no time lost.

Give us a try! Just note quantities, types and sizes that you require on the attached coupon and mail it to us. We'll tell you promptly what we can do.

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Give me price and shipping promise on these items of stainless steel:

Quantity	Type	Size and Finish

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Don't Get Caught in the Spiral

Now is the time of the year when unions are plumping hard for more money for their members. They want higher hourly rates. They want reclassification of work to get more machine operators into higher rate brackets. They want more fringe benefits, not to mention the guaranteed annual wage.

They obviously won't receive all that they ask for. But they will win enough to assure a healthy boost in labor costs to metalworking managements.

The new "cost push," as one observer puts it, already is exerting strong pressure upon the whole production-cost structure and, in turn, upon prices that manufacturers must charge.

Making a study of the prices of industrial products, the McGraw-Hill Department of Economics is convinced that the trend clearly is up. Whether consumer products will rise is not so clear. With farm prices down and industrial prices up, prices in general show a precarious stability that easily can be pushed into higher ground.

Managements, confronted with this situation, are turning over in their minds the question: What can we do to keep from being caught in a dangerous upward spiral? They also are worrying about how to answer another question: How can we keep our costs down and our profits up?

There is no satisfactory all-inclusive answer to these queries. But you can take action along certain lines, for sure.

You can find out whether your machining costs are higher than they should be. You can determine what your handling costs are for parts and materials in process. You can see whether your methods of getting work into and out of machines enable you to make full use of the capacities of those machines.

With labor rates mounting, are you getting the productivity per worker that you should? Can this productivity be materially increased if you install machines of up-to-date design and performance and automate your production?

What is the "increased productivity factor" of your machine tools today compared with 1945? With 1940? Has it kept up to the point where it should be?

Only a handful of companies are taking the trouble to make these comparisons, and if the comparisons are unfavorable, to do something about it. These companies are the valiant few who find it a profitable exercise to survey regularly their production equipment by measuring its performance for the year or two ahead against the projected performance of brand-new machines of advanced design.

Fortunately, more and more companies are recognizing the practical benefits to be derived from a regularized review once a year of the machines installed in their shops. If the arithmetic gives convincing proof of the profit derived from buying new machines, this action is taken.

Some companies that don't put all their machines under the production-cost microscope regularly resort to the next best means of checking. **As any machine goes over the 10-year-old limit, it immediately becomes suspect. From that point on, it must justify its continued use in the shop, compared with a new machine as a replacement.**

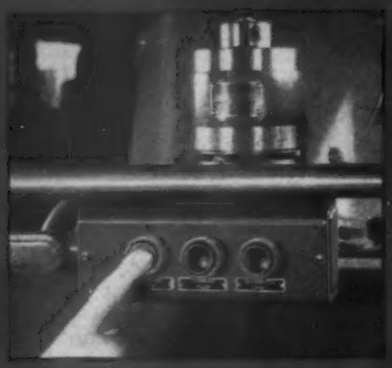
What we are getting at is simply this: With labor costs rising and prices tending upward, the urge to increase your manufacturing efficiency should be irresistible. **One way of doing it is to make use of the latest machines to raise the productivity of your workers. Another is to provide your men and machines with as much automation as possible.**

These two actions constitute the best possible guarantee against getting caught in an upward spiral that might easily upset your costs and hence your profits.

Burnham Finney

Test cuts eliminated

by accurate performance of CINCINNATI Shears...



The Buttons that save time. The great time-saver—the Cincinnati front controlled Power Back Gauge.

Brown-Wales Company says:

"As a steel warehouse, we have comparatively few production jobs, however, we have found that our men with this new shear can turn out far more work in an hour or a day than they could with the old one. In the first place, the power operated back gauge is a great time-saver when changing, as we frequently do, from one job to another.

"Secondly—the greater accuracy of the shear has made test cuts unnecessary, so that down time between runs is greatly reduced."

Write for Shear Catalog S-6.

Photos courtesy Brown-Wales Company, Cambridge, Mass.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

American Machinist

Improved planer tools help slash floor-to-floor time

"Shear-angle" clamp-type holder on 20 planers saves $20,000 per year, cuts floor-to-floor time 14%. Special gang holders cut time 13.8%, save $4000 a year on planing bedways, a high-production job

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WALTER C THUERWACHTER,
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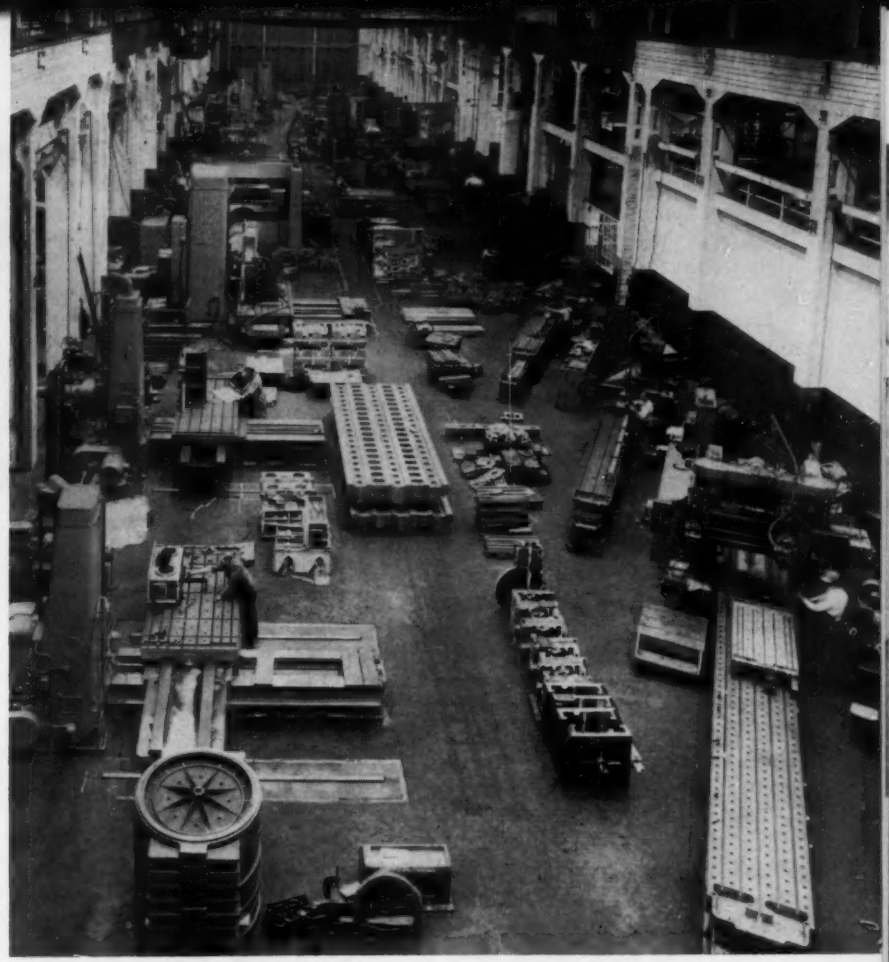
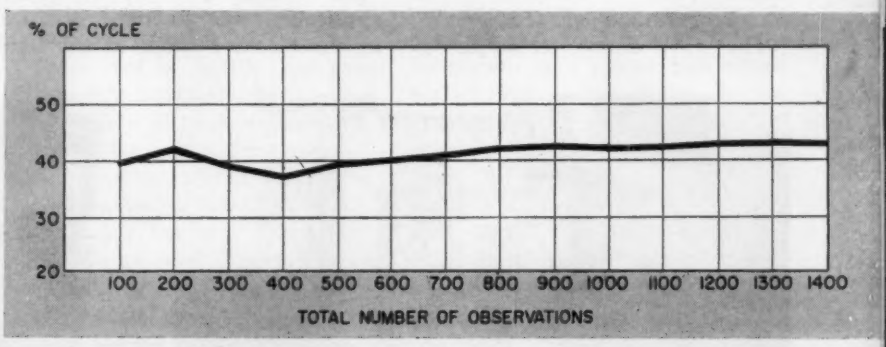
FOND DU LAC, WIS



HIGHER PLANING SPEEDS, reduced downtime for tool changes, and lower production costs have been achieved in the Giddings & Lewis machine shops by developing and applying improved cutting tools



EXTENSIVE RATIO-DELAY TIME STUDY made of planers in G & L machine shops before new tools were developed showed average planer was in operation only 43% of the time—they were out of production 57% of the time for setup or tool changes, or other reasons. Before production efficiency could be boosted, improved setup methods and better tools were needed

As long ago as the Thirties, many shops replaced most HSS tools for planing cast iron with brazed-tip carbide tools. As a result, they were able to rough-plane CI castings at over 100 fpm, instead of 35 to 40 fpm with HSS tools. During this change-over, we were able to reduce floor-to-floor time approx 20% for most CI-planing jobs. However, this could be possible only in plants using relatively new, well-maintained planers. And HSS tools still were necessary for rough-planing steel castings and weldments.

But the first carbide-tipped planing tools were more comparable with those available today, so increases in cutting speeds could not be accompanied by increases in feed. As a matter of fact, feed rates, generally speaking, had to be slightly less for best tool life with carbide-tipped tools than with proper HSS tools.

More powerful planers with higher table speeds have since been designed and built. But while table-return speeds have since been boosted from a common 240 fpm to 300 and 400 fpm,

the speed of the cutting stroke still has been limited in all but a few unusual instances to 120 to 150 fpm when rough-planing high-tensile cast iron with carbide tools.

However, during recent years, industrial and tool engineers at G & L have been reviewing the three basic phases of planer operation, to reduce cost of planing. The three areas studied were:

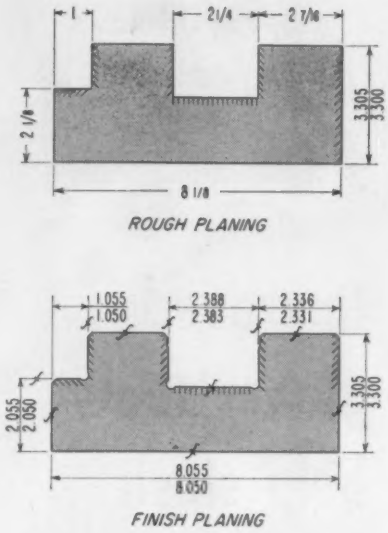
1. **Machining phase,** during which the planer table is in operation, with metal being cut.
2. **Handling phase,** during which the machine is stopped and the operator is loading, reshimming, or unloading a workpiece.
3. **Tooling phase,** during which the operator is changing cutting tools, positioning planer heads, and checking the workpiece to insure accurate tool setting.

To determine which should receive the greatest attention, the ratio-delay technique for making time studies was used. Actually, data for this comparison came from a ratio-delay study made by G & L's Time Study Dept for another purpose, but results were of particular value to an analysis of planer operations.

The ratio-delay technique is based on the assumption that activities observed when making random observations are in the same ratio to each other as activities observed during a constant time study. In this case, the observer made 1400 random observations over a considerable period of time, and noted after each observation the work being performed by each planer operator. A graph of planer running time is shown. It reveals that the average planer was running only 43% of the time. We believe a similar result would be obtained in any plant using planers for machining similar parts.

The ratio-delay study covered all planers in the shop, including those set up for long-cycle jobs (some of which run for more than 100 hr each) as well as those performing short-cycle jobs (measured in fractions of an hour each).

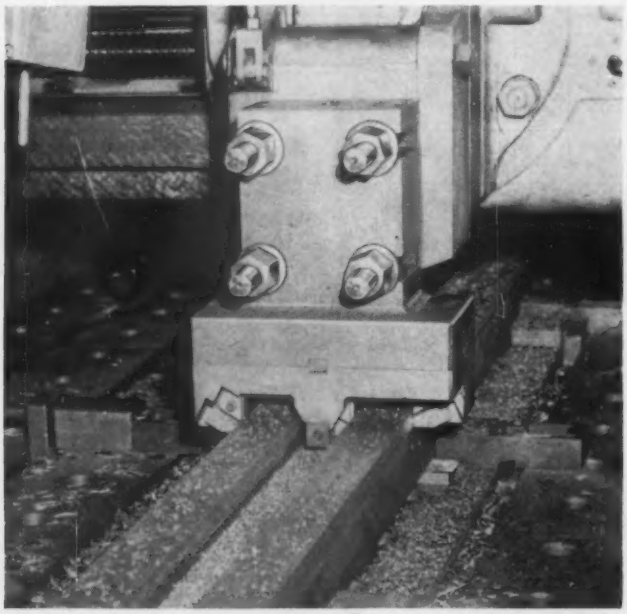
Had the short-cycle jobs been studied separately, the study probably would have shown that running time for the average planer was considerably less than 43% of the average floor-to-floor time. Conversely, longer jobs would have shown a higher average. Planing with carbide-tipped tools, where applicable, was standard practice in our machine shops at the time the ratio-delay study was made.



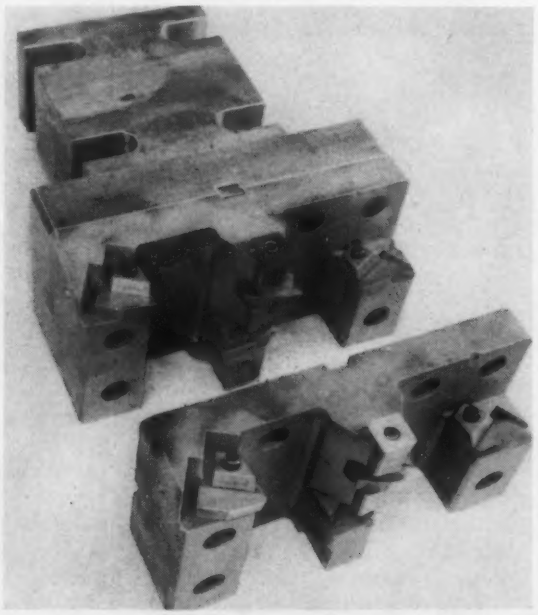
INTERCHANGEABLE HEADS for gang tool used for planing bedways make cuts to tolerances shown. The roughing head leaves approx 1/16 in. of stock on all surfaces for removal by the semi-finishing head. Operations are performed at 100 fpm

Most of our planer jobs consist of planing cast-iron parts, usually rough planing at 100 to 120 fpm, with a feed of 0.045 in. per stroke.

This study indicated that machining time was not the most im-

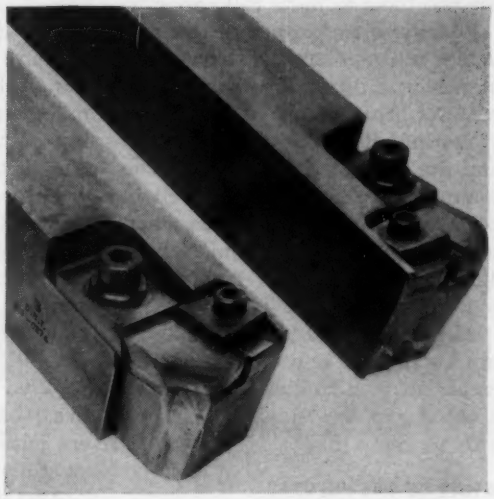


GANG TOOLS developed for rough and semi-finish planing the hardened bedways for small horizontal boring, drilling and milling machines by engineers of G & L's Davis Tool Div made it possible to save $4000 annually by cutting planer floor-to-floor time nearly 14%



ROUGHING AND SEMI-FINISHING HEADS for gang-tool planing of bedways are mounted on heavy holder with five socket-head capscrews and cross keys. Roughing head (below) uses five, and the semi-finishing head (above) uses 11 carbide bits held with clamps and capscrews

USING TWO SHEAR-ANGLE TOOLS developed by Davis Tool Div engineers, this large planer is cutting 187 Bhn CI floorplate at 250 fpm, using 0.090-ips feed with approx 1-in. depth of cut. During this cut, stock was removed at rate of 2.56 cu in. per min. per hp and instruments showed 148 hp was consumed



SHEAR-ANGLE PLANER TOOLS were developed in right- and left-hand types, with 2 x 2-in. square shanks. Cemented-carbide bits are held in place with two clamps, at proper angle for shearing cut

portant factor. So the other two portions of floor-to-floor time deserved more attention—they accounted for more than 55% of total planer time. As a result, every effort was directed toward reducing tooling time and improving setups.

GANG-TYPE TOOLS CUT COSTS

Gang-type tools can reduce tooling time when production quantities justify their cost, so our products were surveyed to find planer gang-tool applications. At the same time, consideration was given to make sure that the planer selected for a gang-tool job would be sufficiently rigid and powerful. Analysis of gang-tool applications showed these benefits:

1. Gang tools make possible the application of a higher percentage of the planer power available.
2. As a result, there would be a desirable reduction in the machining portion of the planing cycle.
3. In addition, single tools require frequent changes and precision settings for the various surfaces. These changes are eliminated, in most cases, when gang tools are employed.

Planing of the hardened ways for our Series 30 horizontal boring drilling and milling machines offered one of the best chances for this type of cost reduction. Engineers of G & L's Davis Tool Division agreed that gang tools could be made for this job. Analysis showed that they would reduce floor-to-floor time for the average way of 13.8%, and that resulting annual savings would be about $4000. Therefore a set of gang tools, incorporating a roughing and a semi-finishing head, was made (sketch and photos).

Where cost is justified by production requirements, gang-type toolholders will in most cases reduce both tool-setup time and machining portions of planing cycles. Their principal advantage is that the operator has only to position the head and feed to depth, once the holder has been mounted. However, chip disposal, especially on long cuts, must be considered.

SHEAR-ANGLE PLANER TOOLS

During the same period, various designs of cutting tools were being tested under the direction of the tool supervisor, and considerable progress was made toward the development of a planer tool which has opened new horizons in the planing of both cast iron and steel at high speeds. During the past year, this tool (photos) has been applied to all of G & L's 20 planers, with savings of approx $20,000, even though older planers cannot

OPERATING DATA FOR CONVENTIONAL AND SHEAR-ANGLE PLANER TOOLS

	Conventional Tool With Brazed or Clamped T-C Tip	Shear-Angle Tool With Clamped T-C Bit
Practical Rough-planing Speed, Cast-Iron Parts	100 to 120 fpm	200 to 300 fpm
Practical Rough-planing Speed, Steel Parts (1020 Normalized)	Not Satisfactory	300 fpm
Practical Rough-planing Feed, Cast-Iron Parts	0.045 to 0.060 ips	0.060 to 0.090 ips
Practical Rough-planing Feed, Steel Parts (1020 Normalized)	Not Satisfactory	0.060 ips
Horsepower Consumption—Cast Iron (Cu In/Min/Hp)	2	2.56

NOTE: *Speeds are in feet per minute, feeds in inches per stroke. Speeds and feeds listed assume ½ to 13/16-in. depth of cut on 187 Bhn cast iron and ⅜-in. depth of cut on SAE 1020 normalized steel. Estimated savings include an estimated reduction on tool-tip maintenance and grinding costs, as shear-angle tools have longer effective life between grinds than do the conventional brazed-tip tools.*

use the tools to their full capacity.

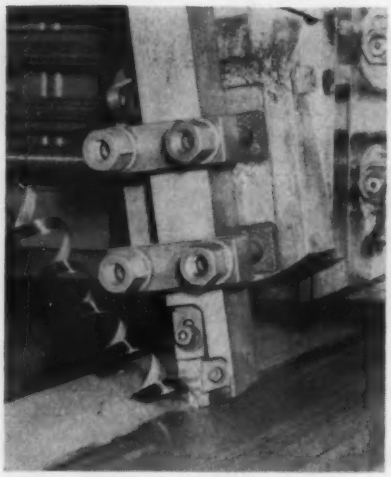
Carbide bits clamped in this tool holder will cut through hard spots in cast iron up to 250 Brinell, and will not break out on ends or sides of castings. Thin pieces do not warp and the workpiece stays cool. The same tool tip cuts equally well in both cast iron and steel, even when semi-finishing steel. Finish produced is good, even when taking roughing cuts at 0.060 in. feed per stroke. This roughing-cut finish can be further improved by a decrease in feed to the point where it could pass the "finishing" standards in many plants.

WHAT OF THE FUTURE?

As time passes, we should expect additional improvements in tool design, and in part setup methods, to further decrease the portion of the floor-to-floor time when a planer is not cutting metal. There are sure to be improvements in tool design that will provide faster and more accurate methods for changing cutting bits and tool holders. And better methods for clamping workpieces are to be expected.

Heavy - duty planer holddown clamps are being developed which should be more flexible in use. In addition, air vises and magnetic chucks offer possibilities. It also is possible that power wrenches will be used more widely. Also, there lies ahead the possibility that planers with latch-type tables will be used more widely.

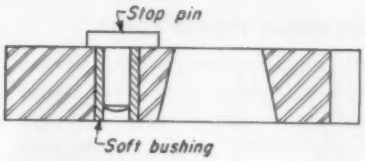
As far as machining times are concerned, planer horsepowers and table speeds are almost certain to continue upward. The ultimate in production is nowhere in sight.



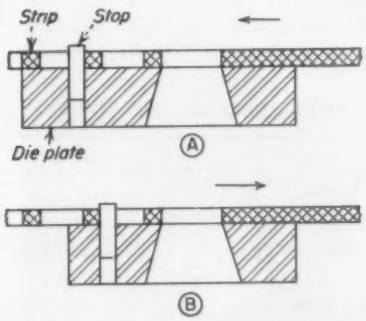
SHEAR-ANGLE PLANER TOOLS work as well when planing steel as when planing CI. In cut shown, normalized SAE 1020 steel underarm for large G & L horizontal boring, drilling and milling machine is being planed at 300 fpm with 0.060-ips feed. Depth of cut is ⅜ in.

Diemakers Kinks

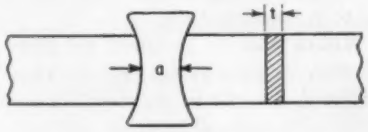
FEDERICO STRASSER



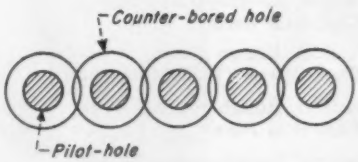
STOP PINS should be put into a soft-steel bushing press fitted into the die plate, instead of press fitting the hardened pin to the hardened plate.



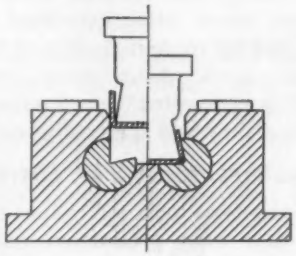
STOP PINS for heavy stock, if located near the blanking opening, are likely to be sheared by forces set up in the metal. To avoid this trouble, skip a station, as at *A*, and locate the pin to bear against the rear end of an opening in the strip. Another method, *B*, is to locate the pin so that it bears against the forward end of the previously blanked opening. In this case, the strip must be pulled back against the pin after feeding, but the construction may be necessary because of size limitations.



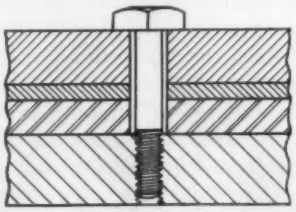
CUTTING-OFF PUNCHES should be dimensioned so that they produce little scrap, but must possess sufficient strength. To compromise, make the smallest width of the punch equal to twice the stock thickness.



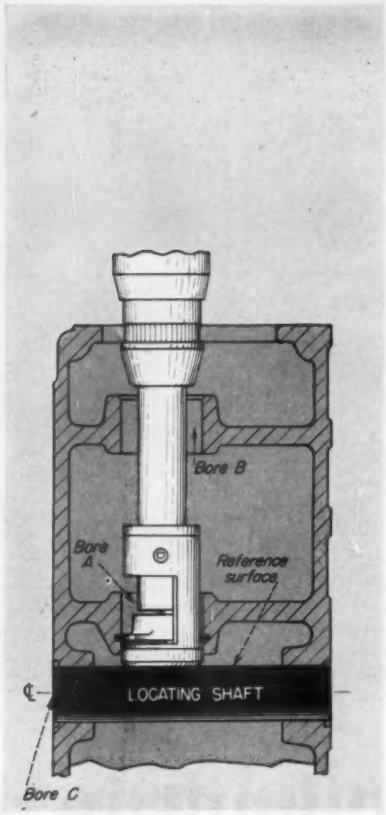
NARROW SLOTS in die plates, strippers and punch holders can be made in this fashion: Drill a row of small equidistant holes. Then enlarge the holes with a piloted counterbore. Hole centers will, of course, be slightly less than counterbore diameter.



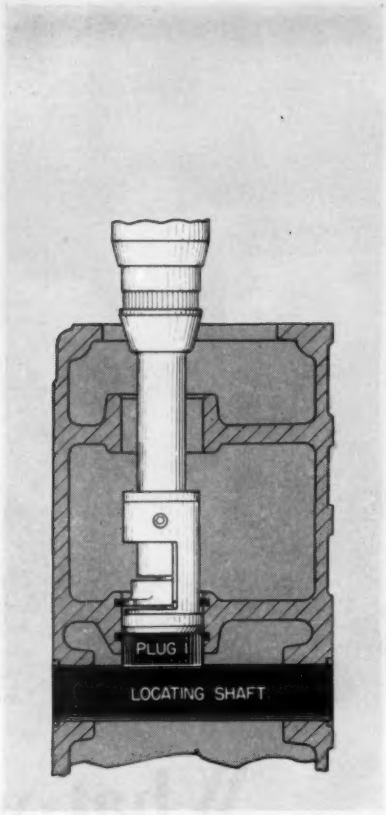
CHANNELS can be overformed to compensate for springback, if the die is fitted with rocker rollers. The blank is placed between the usual stops, the punch forms it into a channel, and when the channel hits the rocker rollers, they turn inward, pinching the channel against the relieved sides of the punch.



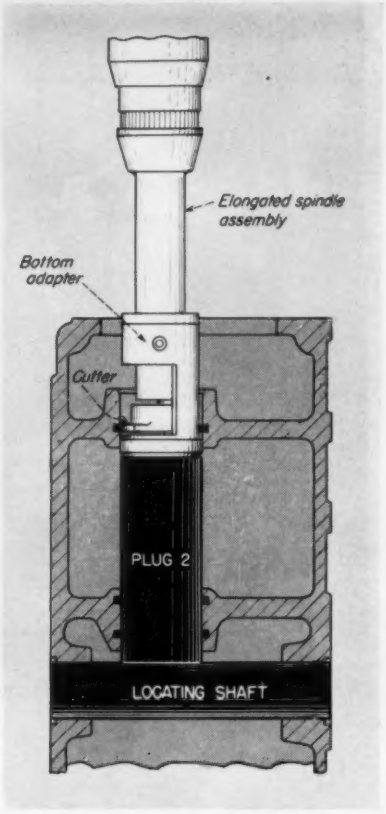
AMPLE CLEARANCE should be allowed in screw holes for stripper plates, die plates, stock gages, etc. Dowel pins and their respective holes are depended upon for alignment, not screws and screw holes, which should assemble readily without interference from close-fitting non-threaded units.



FIRST GROOVE—distance of cutter from end of bottom adapter was set equal to distance of groove from top of locating shaft. Prescribed groove depth was set directly on tool, which was then piloted into bores A and B until bottom adapter banked against locating shaft



SECOND GROOVE—cutter was located vertically by inserting steel plug in bore A and banking toolhead against it. Height of plug equalled distance between centers of first and second groove. Neither cutter location nor groove depth setting had to be changed



THIRD GROOVE—vertical locating plug used here had height which equalled distance between first and third grooves

One grooving tool did this job

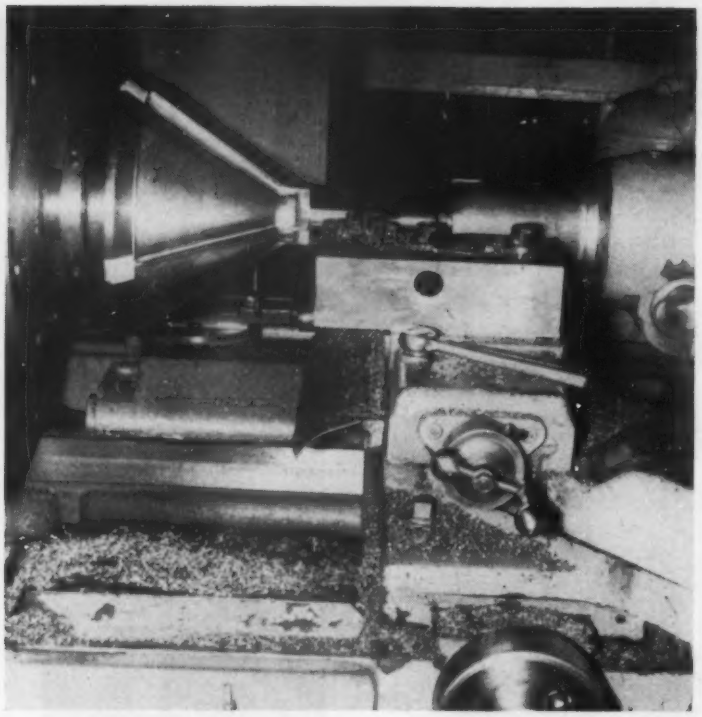
Three internal recesses had to be cut in two bores of 100 cast housings. A simple grooving tool did the job in 17.5 hr after a setup time of 11 min

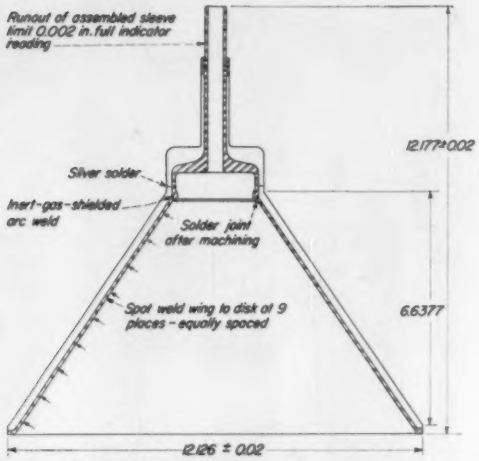
Grooves were to be positioned at prescribed distances from the centerline of bore C with depth and location tolerances held to 0.0015 in. Shape of the castings—15 in. high, 7 in. deep—would have made it difficult to nest them for a boring-bar operation. Alignment would have been complicated because the exterior surfaces were not machined. Finally, with the grooves in bore A more than 7 in. from the open end of the housing, boring-bar chatter could cause a high number of rejects.

An alternative method was sought and found. This was to use a grooving tool, with elongated spindle assembly and bottom adapter, mounted in a drill-press. The housing was held in a large vise and a locating shaft was inserted in bore C to establish a reference surface for the bottom adapter.

The tool, a Waldes-Kohinoor Truarc Model B, is so designed that the cutter rotates in neutral position until additional downward pressure is applied. It then moves into cutting position until preset depth is reached and tool idles. Release of pressure returns cutter to neutral so tool can be withdrawn.

Every groove was held to prescribed tolerance by this method. It was estimated that for the small run of 100 castings, cost of tool and fixtures was covered by resulting savings.




Runout of assembled sleeve limit 0.002 in. full indicator reading
12.177±0.002
Silver solder
Inert-gas-shielded arc weld
Solder joint after machining
Spot weld wing to disk at 9 places - equally spaced
6.6377
12.126 ± 0.002

TOP DISK FOR A CREAM SEPARATOR is contoured on a Monarch 20-in. lathe with air-gage tracer. Tool is triangular Kennametal bit in special heavy toolblock because of interrupted cut, caused by four ribs on cone OD. Job was previously done in 4 or 5 operations; now contouring does job with one cut

What we want in a

Four different makes of tracer lathes in the same shop have allowed comparisons, contrasts, and evaluations. Here are examples of what kind of work they do best, how they have saved time, and what's good about them. Here, too, is one engineer's opinions on how they might be improved

C M NEWBURY, chief industrial engineer, THE DeLAVAL SEPARATOR CO., POUGHKEEPSIE, N Y

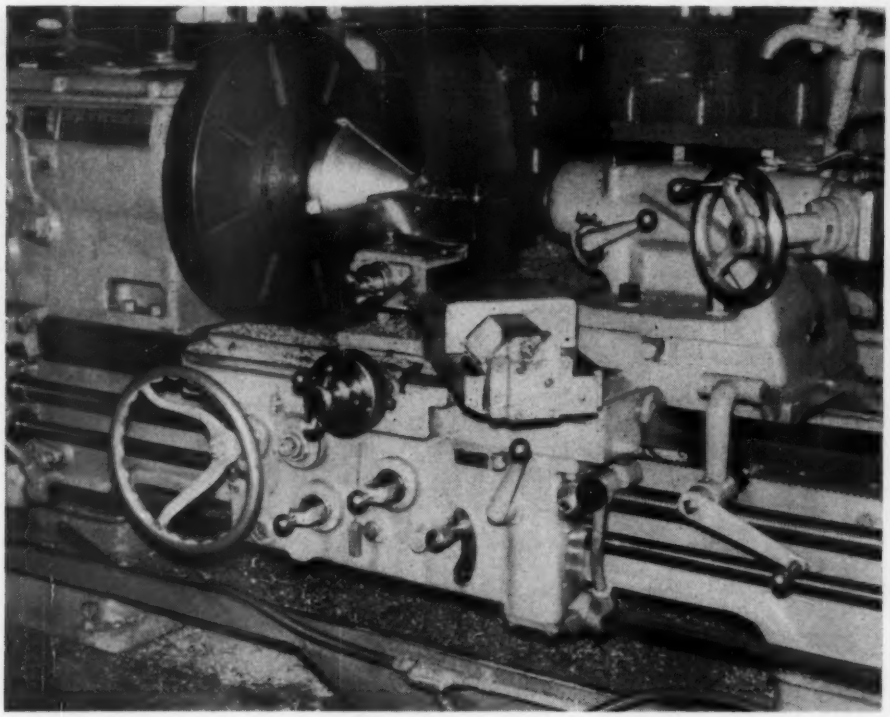
After three years' experience with hydraulic tracing (or duplicating) lathes, DeLaval is firmly convinced that the equipment has an important place in its operations.

Before any were purchased, many foreign and domestic machines were studied and evaluated, and claimed advantages of each were carefully analyzed. The most important points, for DeLaval's work, were stressed as these:

1. . Rugged spindle without inherent chatter, antifriction bearings, design for future faster speeds.
2. . Power for carbide tooling.
3. . Sensible simplified control grouping with minimum number of controls.
4. . Clean functional design for cleanliness and eye appeal; electrical controls grouped in one box.
5. . Hydraulic power unit an integral part of machine; enclosed compact unit.
6. . Easy access for chip removal, stop adjustments, and templet holder.
7. . Strong, sensitive templet-following stylus with minimum overhang and no dead spots.
8. . Rapid, simple feed and speed change.
9. . Full-pressure lubrication system.

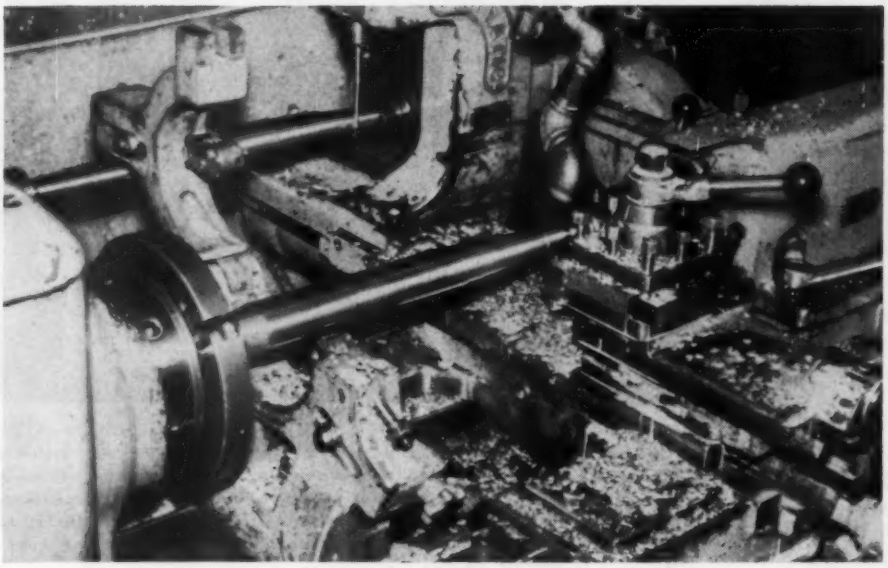
Because they are relatively new, the six tracers now working in the shop have been watched closely and critically. There are two H E B tracer lathes, one Lodge & Shipley "Copymatic," one Monarch air-gage tracer, and two Sidneys with Cincinnati tracing attachments. A wide variety of shaft and chucking jobs has been run in production, and die work has been run constantly in the toolroom. In all cases, substantial savings have been made over older machining methods.

Most parts run through in medium-size lots, averaging perhaps 50 pc, so extensive tooling cannot be justified. But two-dimensional templets are not considered extensive tooling, nor are standard-shape carbide toolbits and tracing stylii shaped to match them. Both flat and round templets are used, though

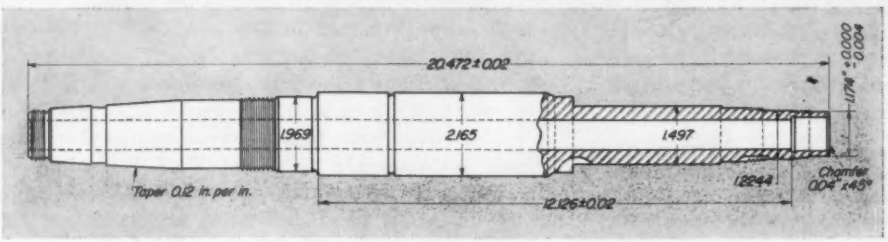


MONARCH HAS ADVANTAGES FOR BOWL AND CONE WORK because slide is mounted at 45° to saddle. Air-actuated tracing stylus is also at 45°; has air flowing at neutral position, so there is no dead spot. Slide backs up as saddle feeds toward headstock, so angular motion is continually smooth

tracer lathe...



BOWL SPINDLE FOR A SEPARATOR is machined on a Lodge & Shipley 16-in. engine lathe with Copymatic attachment. Material is 416 stainless, speed 525 sfpm, feed 0.014 ipr, and depth 0.125 in. Machining is about 64% faster than with previous method. Spindle is hollow, therefore subject to flexing; takes about 21 min to complete



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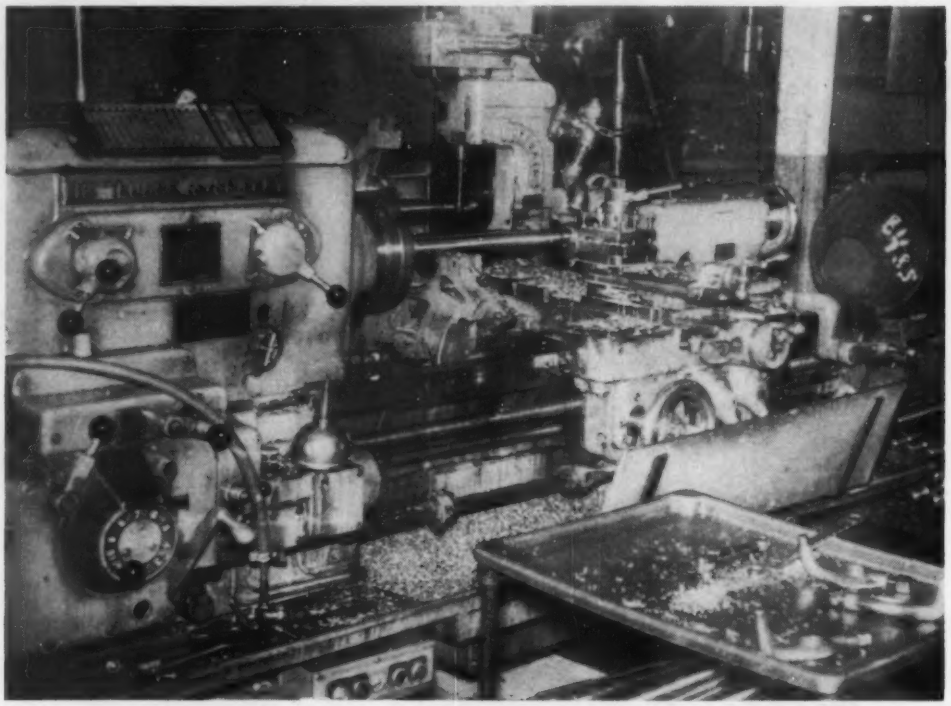
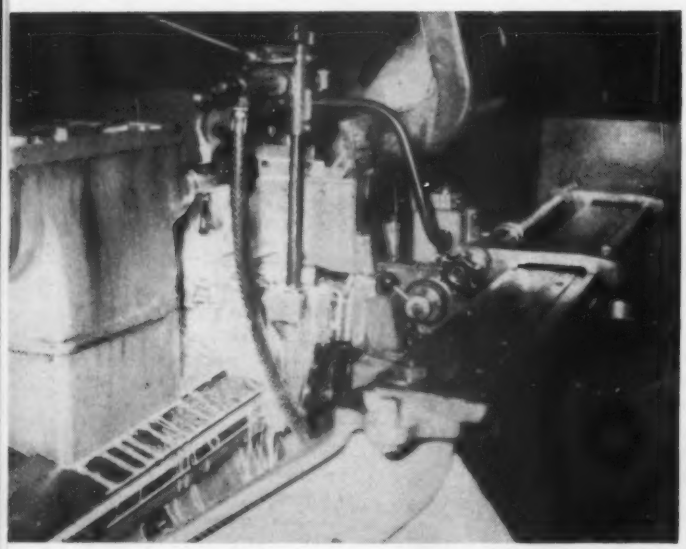
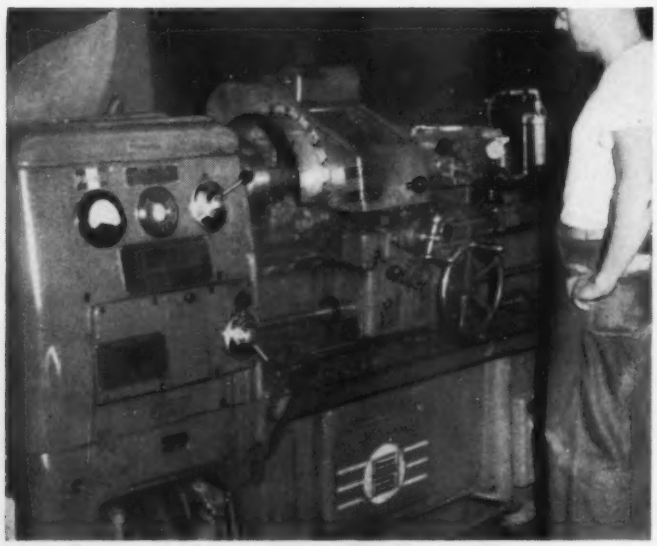
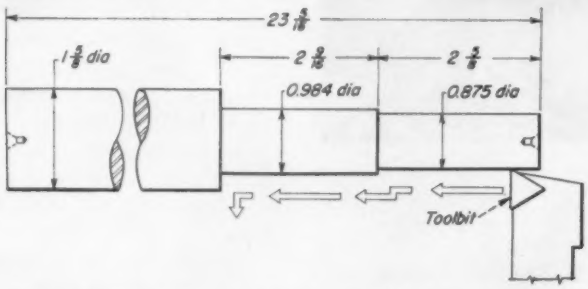


LODGE & SHIPLEY IS RUGGED, FAST, and cuts straight shafts with square shoulders. Separate hydraulic unit for tracing attachment is on floor to rear. Templet holders are strong, located behind and above work

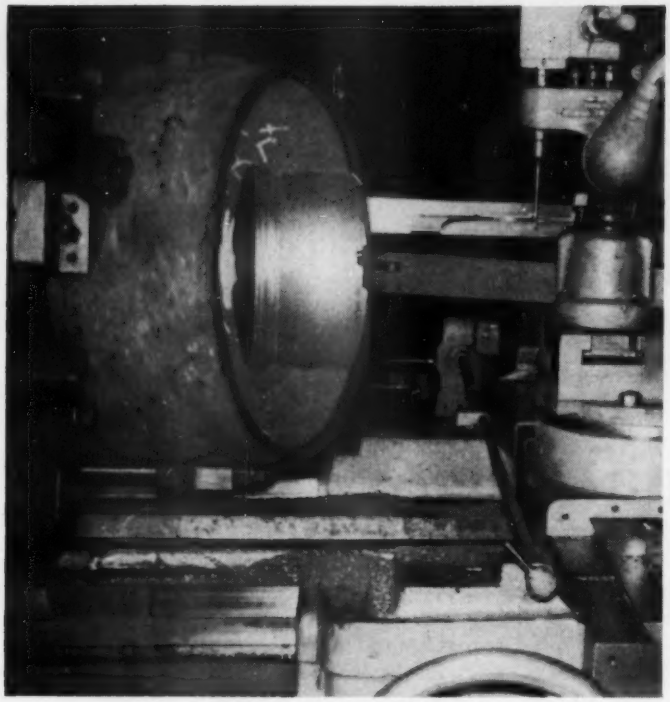




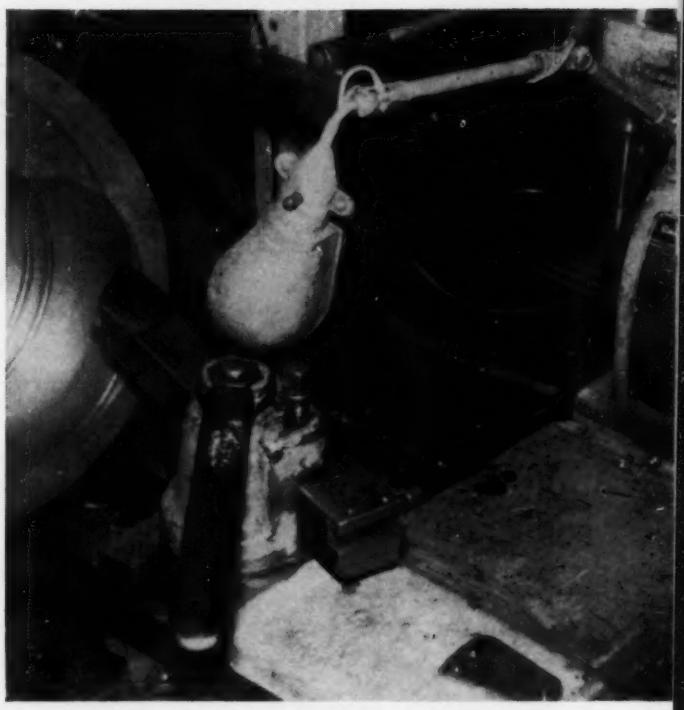
H E B LATHE IS EXCEPTIONALLY FAST on straight-shaft work, has unusually rigid saddle with triangular section. Hydraulic system is integral, with manifold system instead of tubing. Cutting speed on shaft is 300 sfpm, feed 0.018 ipr, depth ⅛ to 5/32 in. Both ends are roughed with the setup; tool will cut 132 pc, if indexed, before regrind. For fine finish, feed reduction of 3½-1 can be quickly switched on



SAE 4140 ROTOR SHAFT is turned on H E B lathe with toolblock adapted to take standard Kennametal holder and triangular bit. Templet (photo, left) is sample workpiece on centers, being followed by rugged stylus with short overhand. If templet wears, it is rotated slightly



MEEHANITE CASTING FOR BULGING DIE is contoured on Sidney toolroom lathe fitted with hydraulic tracing equipment. Machining is much faster and more accurate because operator doesn't have to watch dial-indicator setup with templet at tailstock, straining to keep his eye also on the work, meanwhile operating controls in two directions. Tracing hydraulically eliminates many later polishing operations, gives more accurate shapes.



SIDNEY LATHE DOES DIE WORK, using simple sheet-metal templets and usually carbide tools. Templet setup is easy and quick; works for one-shot jobs; templets take little storage space. This particular bottom-die part had been stored for a couple of years; was called for and set up within a day

round ones are preferred because they have much longer wear life; they can be easily rotated to present a new surface to the stylus.

Fast cutting

An outstanding example of time savings with a tracer is a separator bowl spindle, run either on the H E B or the Lodge & Shipley. Old engine-lathe time for roughing and finishing both ends, which includes a number of diameters and shoulders, was 49.9 min. Present time on the tracer is 16.3 min.

Another job formerly done on an engine lathe is a bowl casing. This is a large-diameter part and not a suitable workpiece for the two lathes mentioned above. It is run on the Monarch in 46.8 min, beating the old time of 81.6 min by 43%.

A typical Monarch job is a 302-stainless bowl, roughed at 250-300 sfpm with 0.014-ipr feed and 0.20-in. depth of cut. Finishing is done at 350-450 sfpm with 0.007-ipr feed. Another job is B-13 bronze, roughed at 500 sfpm and finished at 850 sfpm with a 0.04-in. depth of cut to produce a 63-mu-in. finish. The Monarch does large work that may require a sweeping cut from a small to a large dia, where toolside construction at a 45° angle has a great advantage over straight construction.

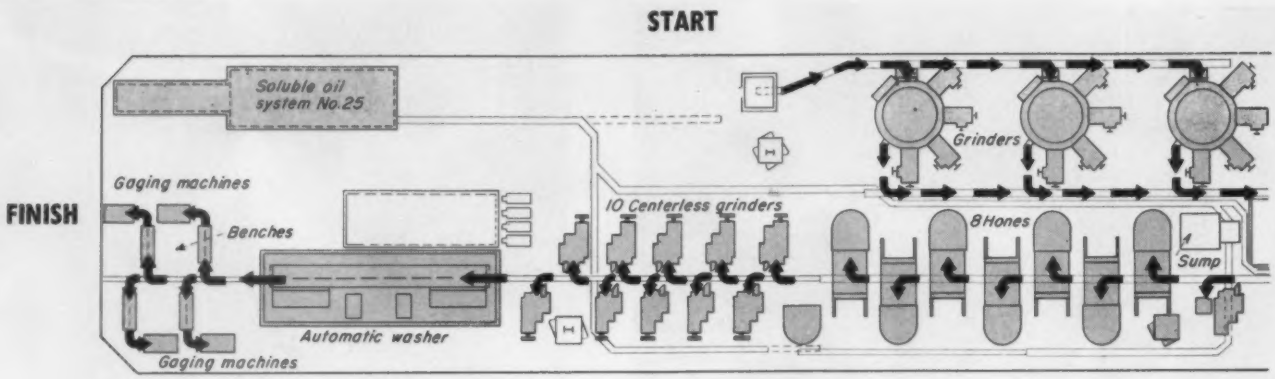
A typical H E B job is a 416-stainless shaft, roughed at 250-450 sfpm, depending on length of shaft, which affects deflection. Feed would be 0.018 ipr and depth 0.125 in. For finishing, speed would be higher and feed would be 0.007 ipr if the shaft were to be ground later. If not, a feed of 0.0056 ipr will produce a 63-mu-in. finish.

A typical Lodge & Shipley "Copymatic" or Sidney job would be a heavier, larger shaft of 316 stainless, hardness at 150-180 Bhn. Roughing is done at 300 sfpm and 0.015 ipr, finishing at 400 sfpm, 0.0056 ipr.

Limit on speed

Flexing in shaft work sometimes keeps speeds down when cutting could actually be done faster on a given material. A set of standards worked out by Dyer Engineering Co, Cleveland, is checked when a new shaft job is about to come into the shop, to make sure specified cutting speed will not cause excessive deflections. Normally, a hollow shaft will deflect even more than a solid shaft, and this must be taken into account to maintain accuracy.

An interesting sidelight on cutting speeds is that there appears to be a second "valley of death" in cutting. Once past the first point on the cutting-speed scale where trouble may develop, there is a long span of clear cutting up to what seems to be a high-speed critical region. This is beyond 600-700 sfpm on the stainless materials worked in the De-Laval shop, and has no effect on present-day cutting. However, it may be a thing to look for in the future when higher machine power, better bearings, and surer controls allow cutting at speeds with which we can only experiment nowadays.



Small-parts automation typified by tappet line

At Ford Motor's Dearborn Engine Plant, valve tappets are made on a compact, continuously automatic line. Principles can be applied to many small parts that require heat treatment, grinding to close tolerances, and other precision operations. Here's the first description of the setup

GEORGE H De GROAT associate editor

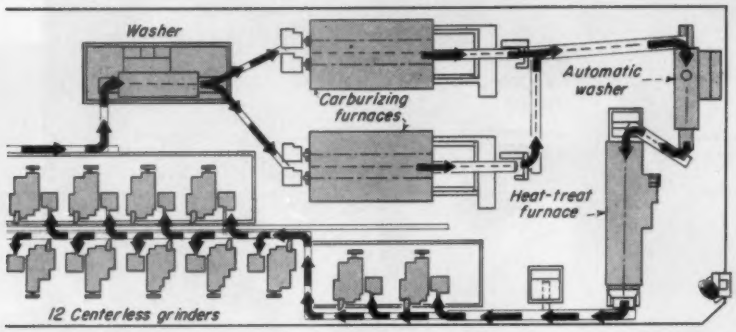
CONVEYOR LOADS SYNTRON VIBRATORY FEEDER at Motch & Merryweather grinder after cold-headed tappets are received from a storage and distributing unit. By metering quantity of parts to be delivered, the storage unit prevents overloading or underfilling feeders at the machines. Guards at chutes leading to vibratory feeders are closed when the bowl is filled, thereby permitting the conveyor to carry tappets to the next machine in the line

Automated production of small parts presents problems quite different from those encountered in engine-block and cylinder-head lines. Considerable ingenuity was therefore necessary in setting up an automated valve-tappet line at Ford's Dearborn Engine Plant where other automated lines have long been a standard for the automotive industry. Geometry and size of the tappets, for example, necessitated unusual handling devices; and fixtures for locating and positioning these small parts had to be precise and accurate to insure uniform processing to close tolerances.

A centralized soluble-oil system supplies coolant to 25 machines—three rotary grinders and two batteries of centerless grinders, one containing 12 machines, the other 10. Special honing machines are equipped with individual tanks and separating systems because of the special nature of the coolant. Chip disposal is conventional as far as automation is concerned in that settling tanks are provided to handle oil and sludge from the machines through underfloor conveyors. Removal of chips and sludge from these tanks is done by means of flight conveyors that load disposal trucks.

AUTOMATIC GRIND AND HEAT TREAT FIRST

Tappets are SAE 5120 steel, cold-headed to shape, with the head trimmed to 0.990- to 1.005-in. dia, a 45° chamfer, and an undercut at the junction with the stem. Stem dia is 0.506 to 0.504 in., with a 0.060-in. radius at the end opposite the head and a 0.183- to 0.188-in. spherical radius in the face at this end. In this stage, tappets are delivered in boxes to a storage and feeding device at the head of the line.

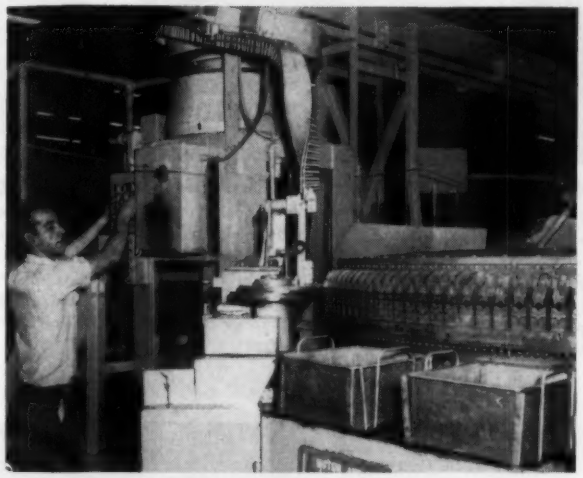


AUTOMATED VALVE-TAPPET LINE improves quality, increases production and cuts scrap losses. Compact layout of equipment saves floor space, permits complete processing of cold-headed blanks through all operations to finished tappets within an area of 16,240 sq ft. Distribution and storage units balance production of the line, while automatic loaders, feeders, conveyors, and other devices eliminate manual handling

Tappets are metered onto an elevator conveyor that carries them to Syntron vibratory feeders from which they are delivered to three special Motch & Merryweather, rotary-table, 4-spindle grinders. These machines rough- and semi-finish grind a 50-in. spherical radius on the tappet head, leaving about 0.001 in. of stock for honing. Two parts at a time are loaded into V-block table fixtures by an intermediate automatic loader, a movable track filled from the vibratory feeder and which loads the stations individually. After loading, parts are indexed to a safety station which assures proper seating in the fixtures. They are then ground in four successive stations to reach the semi-finished stage before being automatically ejected by means of cam-operated pins in the bottom of the V's.

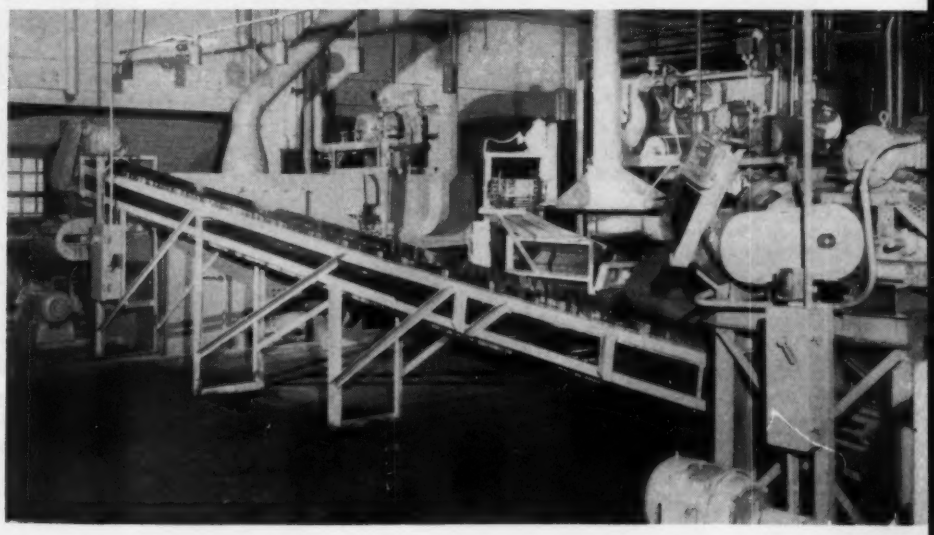
Ground tappets go to an automatic washer, then to two carburizing furnaces fed by loaders, which meter the parts onto conveyors passing through the furnaces. In this operation, a file-hard surface is obtained with a core hardness of R_c 40 max. Depth of carbo-nitrided case is 0.030 to 0.040 in. A second washing operation is performed.

In the first battery of 12 Cincinnatis, stem dias are centerless ground from 0.506-0.504 in. to 0.5002-0.4997 in. Maximum out-of-round and taper are

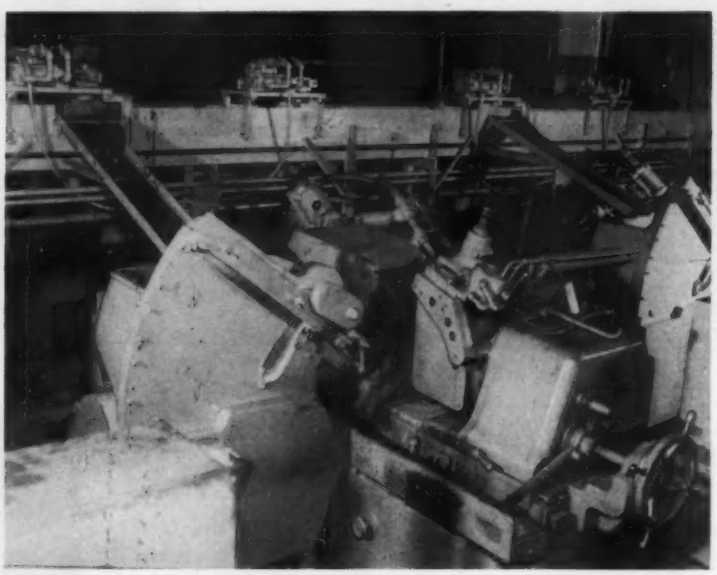


INTERMEDIATE FEEDERS POSITION TAPPETS delivered from Syntron vibratory feeders at three Motch & Merryweather machines. Parts are automatically metered into the intermediate feed track, which is twisted to deliver them to V-block grinder fixtures with the head end out so that a 50-in. spherical radius can be produced. Proper seating in the fixtures is assured by a safety station at the first indexing of the machine before grinding begins. Heads are then ground in four successive stages, after which tappets are automatically ejected into an unloading fixture and from there to a conveyor for transfer to the next operation

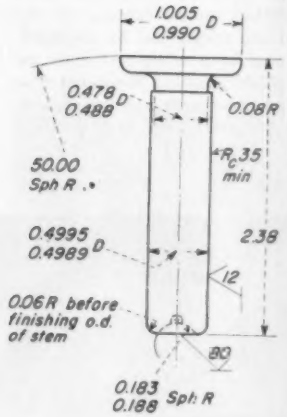
AUTOMATION FOR WASHING AND HEAT TREATING is handled by a system of feeders and conveyors laid out to make best use of space. After heads are ground, tappets are conveyed through an Industrial washer where two flight conveyors at the unload end load four hoppers on two conveyors that deliver them to two Surface Combustion carburizing furnaces which unload into two spiral feeders in an oil-quench tank. These are joined by a transverse conveyor that loads a flight conveyor (foreground) for delivery of the tappets to a Solventol automatic washer. At the end of this washer, a conveyor at an angle delivers parts to a large draw furnace (center background). This furnace extends back beyond the end of the washer so a direct straight-line conveyor cannot be used

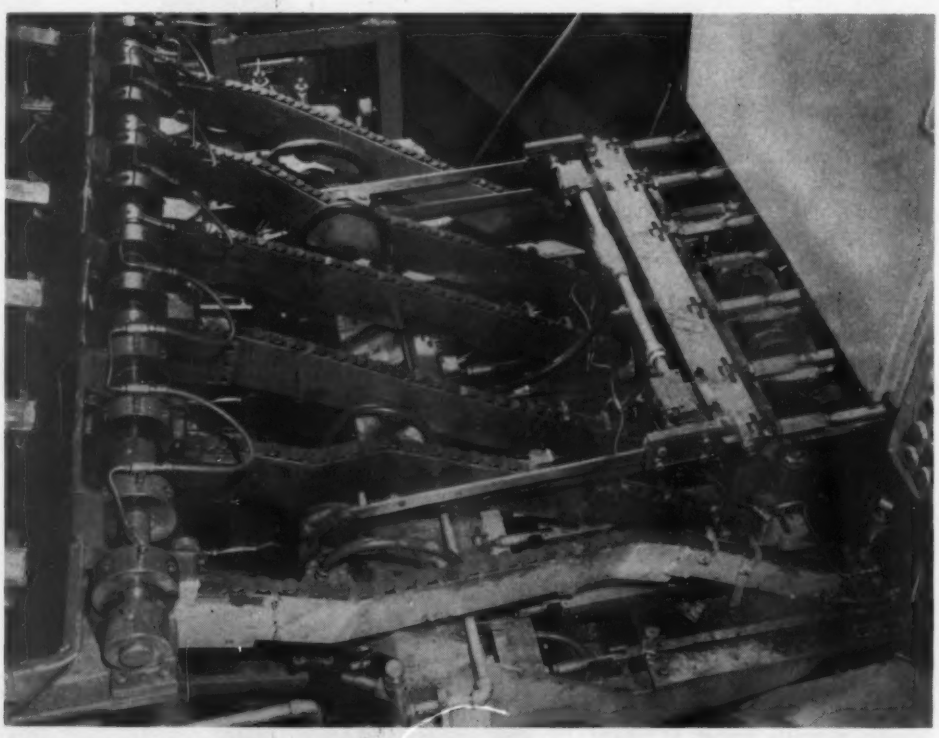


STORAGE AND DISTRIBUTION to machines after heat treat balances difference in productive capacity of machines and furnaces. Here tappets are automatically unloaded from the Industrial Metal Fabricating furnace, (where they were drawn at 350 F for 1 hr a hardness of R_c 61 min) into a flight conveyor that loads a storage hopper. The hopper meters tappets into another chain conveyor that carries them to a line of grinders

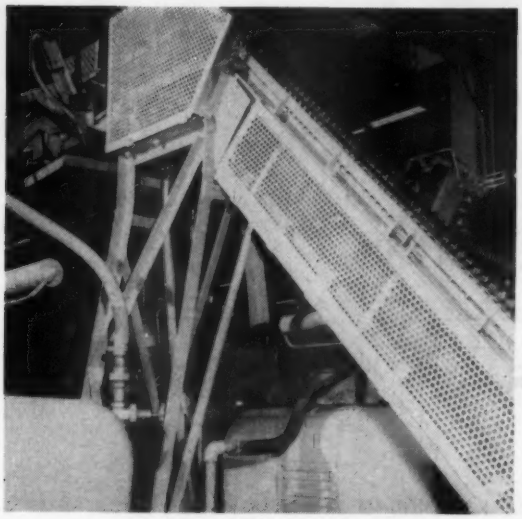


GRINDING TAPPET STEMS IS AUTOMATIC in these Cincinnati centerless grinders loaded by means of "Feedmatic" devices. Parts are delivered to loaders from the conveyor in the background, which gets them from the storage hopper. Each Feedmatic has a hopper from which the loading mechanism draws, picking tappets up in a feed chute in the correct position for grinding. Finished parts are ejected from the grinders into a belt conveyor that carries them to a battery of Hoern & Dilts machines

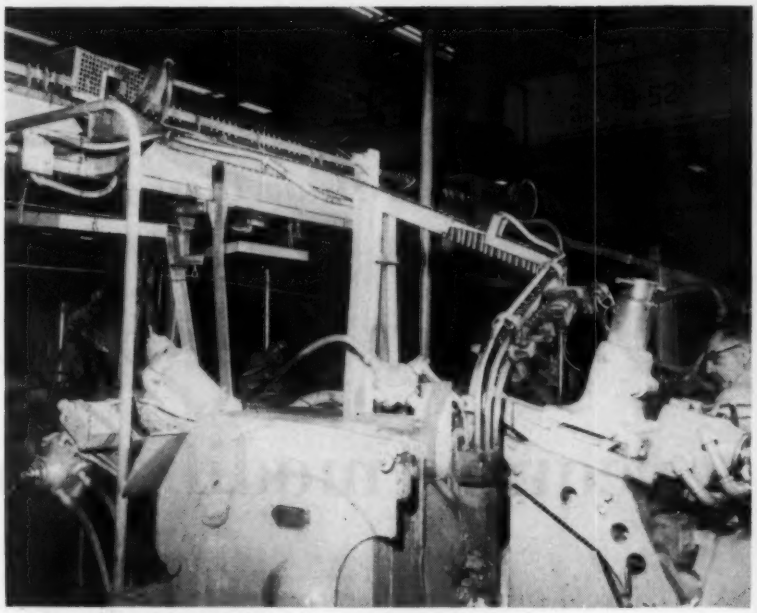




ABOUT 0.001 IN. OF STOCK IS REMOVED in honing 50-in. spherical radius on tappet heads in this automatic setup. Vertical-spindle, indexing-type Hoern & Dilts honing machines are each equipped with six automatic loaders so six tappets are loaded at once in first index. Work is positioned and delivered to diaphragm chucks under spindles from hoppers via feed tracks with the heads up. Second index semi-finishes, third finish-hones the heads, after which tappets are automatically ejected into slide rails of another automation unit



SPECIAL CARRIER TRANSFERS HONED TAPPETS to conveyor for delivery to grinders. Slide rail at honing machines engage the tappets in with lugs on this elevator-conveyor so transfer is made to magazines at grinders with the parts in position for easy pick-off



AUTOMATIC DELIVERY OF TAPPETS from conveyor to Cincinnati centerless grinders is accomplished by pick-off devices that load chutes. Parts are properly positioned for finish-grinding stem dias before entering magazine-type loading fixtures. Regulated quantity of parts delivered to the machine insures steady, uniform rate of feed based on production capacity of the machine for this particular job. Ejection is automatic, too, and positions the tappets on a special conveyor for transfer through a washer before inspection

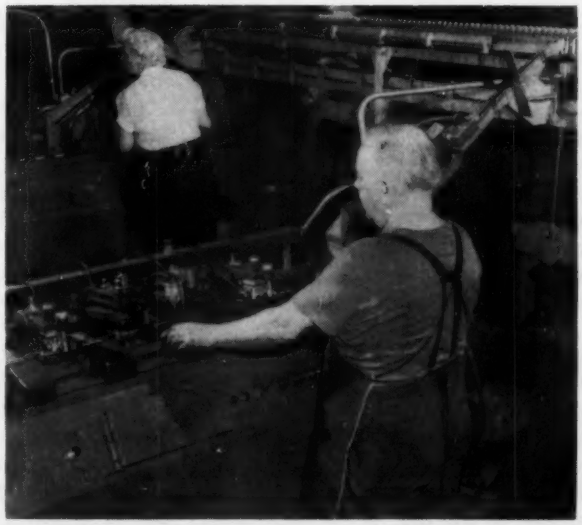
held within 0.0003-in. tolerance. Work ejected from the grinders is carried by chain conveyors to a battery of 8 Hoern & Dilts vertical, indexing-type, honing machines, each equipped with six automatic feeders. At each machine, six parts are loaded into diaphragm chucks at the first station, where they are also automatically ejected after completing the cycle. Second index takes them to a semi-finish hone station and the third finishes the 50.00-in. spherical radius to a surface finish of 8 mu in. rms. Honed tappets are ejected into slides that engage them under the head and carry them to a chain conveyor for transfer to the last grinding setup.

FINAL GRINDING

This installation consists of 10 Cincinnati centerless grinders where stem dias are finish-ground from 0.5002-0.4997 in. to 0.4995-0.4989 in. with a finish of 12 mu in. rms. Grinder magazines are loaded by automatic feeders fed by a belt conveyor from the honing setup.

Ejection from the work-rest blade of each machine positions finish-ground tappets with head ends up so that they can engage lugs on a special conveyor that carries them through an Optimus washer. This is followed by inspection in the electronic machines shown. Rejected tappets are segregated into scrap and reclaimable pieces.

As a result of this automated line, tappet production rates have increased—but more important, quality has been improved and scrap losses reduced.



AUTOMATIC INSPECTION is accomplished in four special Merz 4-station electronic gaging and segregating machines where tappets are checked for squareness of the head relative to the stem, out-of-roundness of the stem, barrel shape and taper in the stem and stem dia. Parts within limits pass through the machine for delivery to a visual inspection station, others are segregated into reject and repair categories

Cope Talks on Draw Dies . . . XXVIII

Drawing dies for stainless require modifications

To avoid scratches and score marks on deep-drawn stainless steels or nickel alloys, you will have to choose die materials with suitable characteristics

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, INDIANA

Stainless steel, nickel and high-nickel alloys may be drawn in either single- or double-action presses in dies similar to those used for drawing ordinary steel, but with these modifications:

1. The dies must be larger and stronger than ordinary drawing dies because of the greater strength of these materials. This is particularly true of pressure pads, which must exert at least twice the pressure required for ordinary steel to keep shells free from wrinkles.

2. Working details of the die must be made of special materials to eliminate or reduce the tendency of stainless steel to pick up and load the die. Ordinary materials will scratch stainless steel badly and may even cause the work to freeze to the die.

Satisfactory die materials are: hard alloy bronze; heat treated nickel-chromium cast iron; hard, wear-resistance tool steel; hardened, chromium-plated steel; and, for very small work, tungsten carbide. Drawing punches, draw collars, and pressure pads may be made of tool steel, provided the tool steel is of the "slippery hard" type known as "tungsten finishing steel." This is a water-hardening tool steel that tends to shrink on hardening. For this reason it is most useful in smaller dies and in dies which are not likely to crack on hardening.

For more intricate dies, or dies which cannot be ground to size after hardening, an oil-hardening, high-carbon high-chrome die steel should be used. For the largest and most complicated dies, air-hardening die steel should be used. Hardened, chromium-plated steel and graphitic tool steel are also satisfactory materials.

Tool steel should not be used for the die ring or the female members of a die, unless the draw is shallow, or the die forms the metal by a bending or folding action. Stainless steel, nickel and nickel alloys have a strong tendency to gall against tool steel, even when used for punches and draw collars. In these cases the details receive relatively small amounts of wear as compared with the die ring itself. For this reason deep shells cannot be drawn entirely free of scratches and score marks when tool steel is used.

Nickel-chromium cast iron is superior to tool steel, and does not have nearly as much tendency to pick up the metal and to gall against the die. This is an ideal material for drawing punches, draw collars and pressure pads; and in many cases is suitable for the die ring itself. The analysis of this material should be as follows:

	Per Cent
Carbon	3.10-3.30
Silicon	1.25-1.40
Manganese	0.70-0.90
Nickel	2.50-3.00
Chromium	0.60-0.75

For the larger runs the details should be heat treated to 400 Brinell.

Meehanite iron has proved satisfactory when used for all die members for drawing sauce pans, kitchen sinks and similar articles.

Die rings or female members of deep-drawing and redrawing dies, should be made of a suitable grade of hard bronze alloy (Ampco Metal, for example). If the shells are deep, and must be entirely free of scratches and score marks, the drawing punches and draw collars should also be made of such material. The bronze alloy and the stainless-steel work material, being dissimilar, have no mutual attraction.

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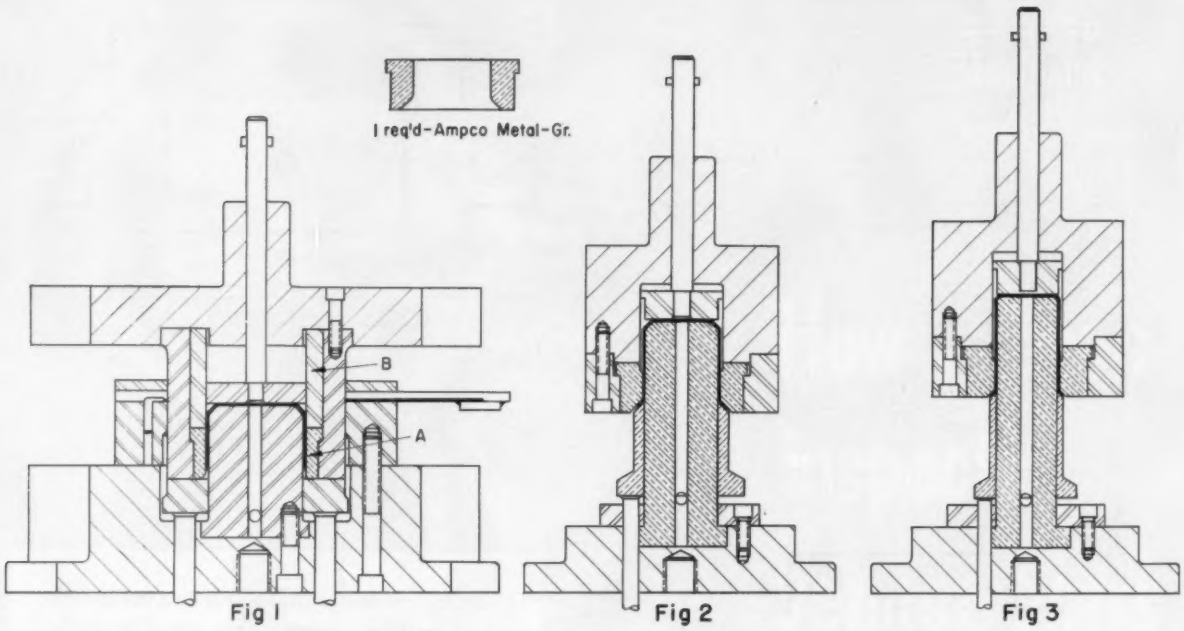
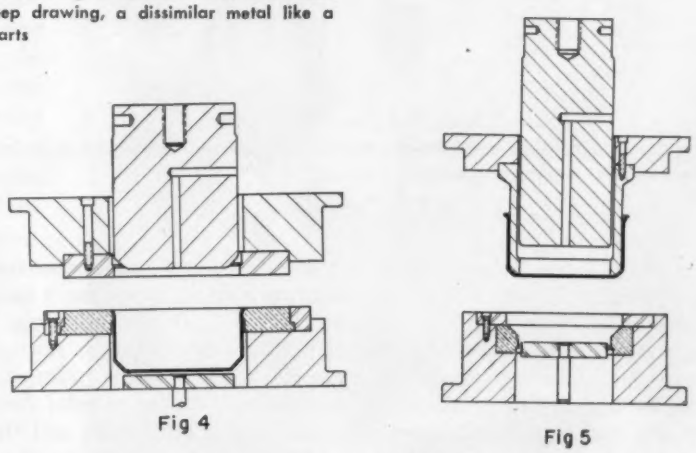


FIGS 1 TO 3 ... Galling and pickup are problems in drawing of stainless steel and nickel alloys. To minimize these conditions, especially in deep drawing, a dissimilar metal like a hard bronze alloy is used effectively for press-tool parts



FIGS 4 AND 5 ... Bronze inserts are used only for the die rings of these large drawing and redrawing dies, and the punches and draw rings are made of cheaper nickel cast iron

After a die containing Ampco Metal parts has been made, it must be carefully "broken in." This is accomplished by smearing the die liberally with white lead mixed with linseed oil, or some sulfur-base oil, all mixed to a consistency of about 600W motor oil, before any metal is formed. During the forming of the first few stampings, the sulfur helps to polish the die, and forms a film on the die surface.

It is important to provide a separate press for each operation so that all operations can be performed in succession. Stainless steel, nickel, and high-nickel alloy shells should never be allowed to lie around between operations. They are subject to season cracking, especially if left overnight. Small cracks cause the shells to burst open when an attempt is made to reduce them further. Moreover, shells reduce better when the steel is warm from the last operation.

Wherever possible, dies should be set in the press so a small flange is left on each shell. The flange lessens the risk of season cracking.

Shells must be handled carefully and not allowed to bump against each other or fall through great heights when they are ejected from the die. Otherwise they will become scratched and damaged.

Applications of hard-bronze die members are shown in Figs 1 to 3 in respect to a set of single-action dies for drawing a stainless-steel shell. For the first-operation die (Fig. 1), it is common practice to make blanking rings, draw rings and drawing punches of high-carbon high-chromium steel, and use Ampco Metal only in the die at *A*, where the greatest pressure occurs. Part *A* is retained by means of a shoulder and is held in position by filler ring *B*. For large dies the draw ring and drawing punch may be made of special nickel cast iron.

If the shells must be entirely free of scratches, the working details of redrawing dies should be made entirely of bronze alloy, as shown in Figs 2 and 3. The punches and dies are provided with shoulders, and are retained with machine-steel rings, so that it will not be necessary to tap the bronze —ordinarily a difficult operation. As the bronze is expensive and wears rapidly as compared with tool steel, the female die rings for all three operations are made alike, with the exception of the holes, to permit interchangeability. When

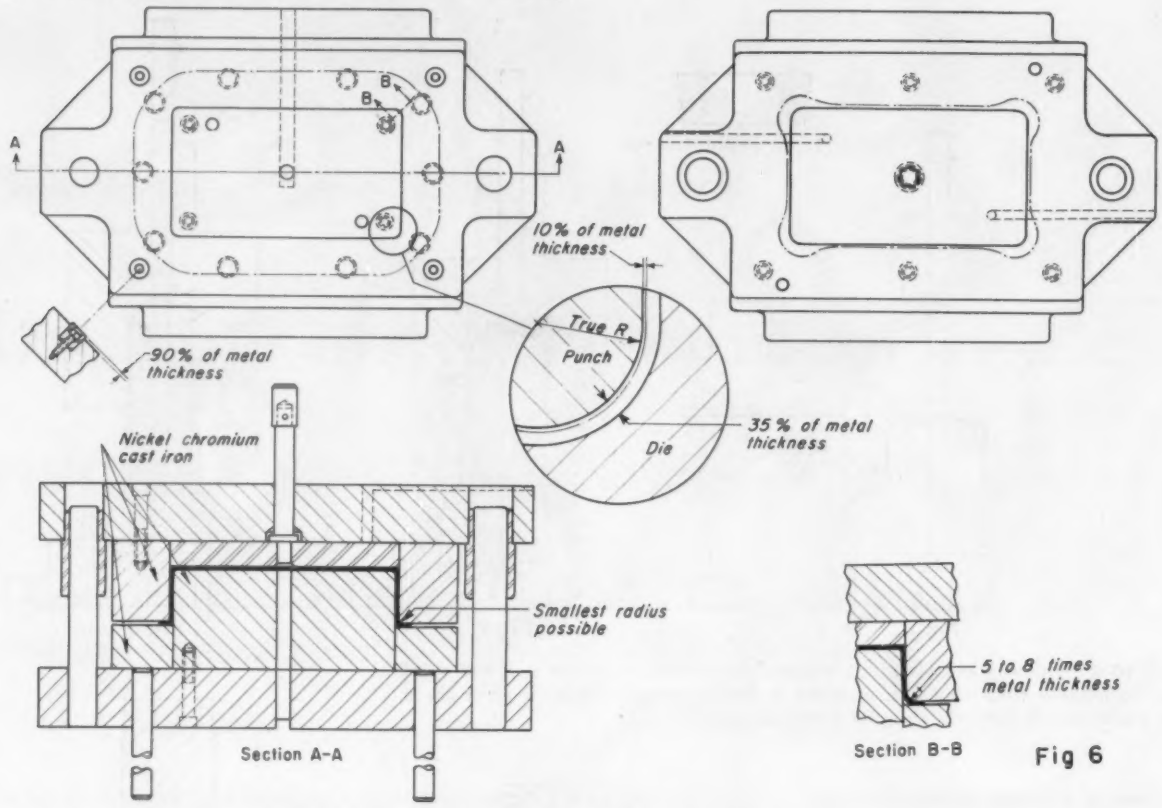


FIG 6 . . . Corner radius governs the depth of drawing a square or rectangular shell. Details show the radii and clearances required

the die rings have become worn and oversized, it is only necessary to replace the worn ring in the last operation. The worn ring in the third-operation die can be reworked for use in the second operation die, and the second operation die ring can be reworked for use in the first-operation die. Draw collars and drawing punches for the redrawing dies can also be designed to be interchangeable.

If some scratches are permitted in the inside of shells, draw collars and drawing punches may be made of high-carbon high-chrome tool steel.

Drawing and redrawing dies with bronze inserts, for use in double-action presses, are shown in Figs 4 and 5. Because of the size of these dies, bronze is used only for the die rings. Punches and draw rings are made of special nickel cast iron.

The shells are ejected with positive knockouts, instead of being allowed to pass through the dies, as when drawing ordinary steel. It is necessary to eject the shells because a small flange must be left on the open ends to reinforce the rim, where stress cracks normally begin. This is good practice, if permissible, when the total reduction of the shell is high and there is a probability of failures due to stress cracking. Moreover, when a flange is not left on the shell, it is necessary to iron out wrinkles. These occur when the shell is released from the draw ring and passes over the drawing radius to be disposed of through the die.

Ironing of wrinkles strains the end of the shell and causes bronze die rings to wear rapidly. Further, the ironing action causes the metal to flake off and load the die.

Cutting edges may be added to the die shown in Fig 4, if it is desired to blank and draw the first-operation shell in one operation.

SQUARE AND RECTANGULAR SHELLS

As with other materials, the depth to which rectangular shapes made with Monel metal, nickel, or Inconel, can be drawn in one operation is governed principally by the corner radius, Fig 6. Consequently, this radius should be as large as possible. The depth of draw should be limited to from 2 to 5 times the corner radius for Monel metal and nickel, and to not greater than 4 times for Inconel. The permissible depth depends also on the dimensions of the box, and on whether the box has straight or tapered sides. The depth of draw for thin stock, say thicknesses under 0.025 in., should not be over 3 times the corner radius for Monel metal and nickel, and less than that for Inconel.

The drawing radius of the die should be as large as possible, say from 4 to 10 times the thickness of the metal. It is essential that the blank not be released from the pressure pad too soon, to avoid wrinkles in the corners at the open end of the shell.

Part XXIX of Mr Cope's series will appear in an early number.

American Machinist

SPECIAL REPORT NUMBER 393

How Allison inspects vendor parts

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superintendent, Gage Control

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Frequent design changes, uneven scheduling of parts and sub-assemblies, and the need for inspection of small quantities of many complex, easily distorted assemblies — these are problems for makers of turbojets and turboprops. For example, more than 80% of the parts for the new model 501-D 10 turboprop (below—2.3 hp/lb, drives a 13.5 ft-dia reversing prop) and other gas turbines are purchased by Allison from vendors. Allison's Aircraft Engine Operations has worked out a receiving-inspection procedure that saves time and money, increases inspection flexibility, and improves relations with vendors making jet-engine components.

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Inspection operations are of three types...

Inspection of purchased parts, subassemblies and proprietary components is a major activity in the aircraft gas-turbine plant of the Allison Division of General Motors Corp, because a great percentage of the parts in our turbojet and turboprop engines are supplied by vendors. Receiving inspection is further complicated by the fact that purchase orders necessarily call for relatively small quantities of a large number of complex subassemblies and components for which dimensional and performance specifications have small tolerances.

Allison currently is making various basic gas turbines, each in a number of different models—to suit special requirements of the Air Force or the Navy, the needs of the particular aircraft in which the engines are used, and to incorporate in new models improvements that result from a continuing research and testing program. Engineering design changes are frequent, and parts passing through the receiving-inspection department often have been made with temporary tooling.

Many subassemblies, and some individual parts, are fabricated from thin stock, or have thin walls and rims, so are flexible and unstable dimensionally until supported by the other units to which they are attached. To inspect these parts for dimensional accuracy, the receiving-inspection department must use confining or restraining fixtures that will support them.

When analyzing problems involved in maintaining proper quality control, it was agreed that inspection operations fell into three groups:

1. Machined parts and subassemblies which require accurate dimensional inspection, both to insure that the parts are made within specified tolerances and to provide design engineers with exact knowledge of part dimensions so they can determine changes needed to insure development of engines with maximum performance characteristics.

2. Castings and forgings which require qualification with target-type fixtures to determine that they will clean up on all required surfaces when machined, and which must be checked with ultrasonic or fluorescent-penetrant methods.

3. Operating components, like pumps, valves, actuators, electrical switches, thermocouples, etc, which must be tested for operating characteristics, as well as dimensional accuracy.

In the first group, inspection facilities could be fixed gages specially designed and constructed to check specific parts, or general-purpose inspection equipment to use layout inspection techniques. The fixed gaging concept was discarded after careful study, because of its lack of accuracy, high original and maintenance cost, almost continual rework or replacement to satisfy engineering changes, long design and procurement times, and similar drawbacks.

The general-purpose concept of inspection by layout techniques was adopted for all except small parts which can be checked with conventional gages at inspection benches, because it offered many advantages over fixed-type special gages. Results to date have fully justified this choice.

Despite the many obvious problems that must be faced when checking parts by the layout method, which include the wide range of size of parts and subassemblies to be checked, and the precise dimensional requirements as to diameters, concentricity, squareness of faces, hole location, axis relationships, locations of pads, etc, there seems to be no alternate method as satisfactory.

In checking parts and subassemblies, we are always better off when we have exact, or as nearly exact as possible, knowledge of the physical dimensions of the parts. This is particularly true when checking parts made with temporary tooling for new engines.

As many of the parts are extremely complex, they present a major challenge to even a top layout man, because with low-volume production the work does not repeat often enough to develop an inspection pattern when the procedure to be followed is left up to individual inspectors.

To solve this problem, and to make it possible to expand the inspection program quickly in case of increased schedules or mobilization, standard predetermined inspection procedures have been written for all parts checked by the layout method. For smaller, less-complex parts, a standard form has been devised (see example) for listing inspection operations and for specifying gages. When parts are complex, special forms are devised to add spaces for the inspector to record actual measurements.

Procedures have all mathematics calculated in

How Allison inspects vendor parts...

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General-purpose inspection equipment . . .

. . . makes possible precision checking of incoming parts for a wide variety of gas turbines without costly fixed-type gages. Predetermined procedures insure complete evaluation of all workpieces

advance, saving the inspector much valuable time. In addition, because operations are listed in sequence, one inspector can pick up where another has left off, as at the end of a shift without worry about need for rechecking previous operations. The first inspector merely signs off after the last operation he has completed.

Inspection-procedure routing sheets for major components are written so checks of simple nature, like hole diameters, pin sizes, etc, are performed by less-skilled inspectors working at benches or surface plates, leaving the more-difficult setups and measurements to skilled layout men. But even these more-difficult jobs also are listed and spelled out in considerable detail. Even procedures for making and checking setups, prior to checking the workpiece, are written.

There is nothing really new about the equipment for layout inspections except, perhaps, in the accuracies required in the tools and gages. The basic inspection station for layout operations includes a precision granite or CI surface plate with one or more fixed or tiltable precision rotary tables (see photos), and necessary height gages, precision dial indicators or air-gage heads, sets of gage blocks and Pla-Chek master height gages, and conventional precision angle plates, sine bars, height blocks and cubes, parallel bars, etc. Where necessary, optical cathetometers (photos) also are provided. Storage cabinets and benches are provided at each inspection station, so needed gages and other tools can be kept close at hand.

An important advantage of the general-purpose inspection equipment now used is the fact that increased emergency production requirements can be handled easily by adding shifts, upgrading inspectors, and adding more general-purpose tools, which can be secured in less time than it takes to design and make special gaging equipment. Even should production requirements to be large enough to justify special gages, the general-purpose tooling can keep production moving while special tooling is on its way. In almost every case, a plant is at least nine months away from tool tryout once a program has been authorized.

In addition, general-purpose gaging equipment would, in emergency, make it possible to change quickly from one design to another—even to quickly start qualifying parts for engines developed by a competitor.

The diaphragm type chucks selected to hold many parts in constrained condition while they are inspected have interchangeable jaw inserts that can be replaced and reground quickly.

On castings and forgings, general-purpose checking setups can qualify parts prior to machining, until target-type gages are available. Equipment for fluorescent-penetrant inspection and ultrasonic checking is already sufficiently flexible.

Acceptance and calibration of proprietary units, like pumps, switches, thermocouples, etc, generally is another problem, as very precise measurements of performance usually are necessary. Yet, even here, Allison has found it possible to develop, with the aid of General Motors' Process Development Section, special test benches (photos) that permit testing a range of similar units without expensive alterations in setups.

How Allison inspects vendor parts... *a special report*

WM-1483-1

RECEIVING INSPECTION PROCEDURE
AIRCRAFT OPERATIONS

Keep Work Place Clean and Orderly
Use Care in Handling Gages and Filling Out Gage Record Cards
Report Abnormal Conditions to Supervision Immediately
Observe All Safety and Shop Rules
Follow Instructions Carefully—"Quality Is Essential"

Part No. 6740331
Change Letter B
Name Manifold Assembly
Date Written 11-26-54
Supersedes
Sheet 1 of 4

DEPT.	OPER.	INSPECTION	SAMPLING PLAN	GAGES	GAGE NO.
		INSPECTOR – ALL REJECTIONS MUST BE REVIEWED BY YOUR SUPERVISOR			
		CHECK RECEIVING SHEET FOR LABORATORY RELEASE			
		TEST PLATE LAB ☐ 2-3 PCS ☐			
		ROCKWELL 1% A.Q.L. ☐ 100 % ☐			
		MAGNAFLUX 1% A.Q.L. ☐ 100 % ☐			
3518	1	Pressure test to 500 psi.	100%	Pressure test equipment (end fittings)	AD-380006-6 (22) AD-380001-16 (1)
		(See 6728015-16)			
	2	1 5/16"-12 N3 thd 1.2584"-1.2624" P D	2.5%	Double-end plug thd gage for 1 5/16"-12 N3 thd 1.2584"-1.2624" P D	Std
	3	1.236" Max Minor Dia	2.5%	Single-end plug gage for 1.236" Not go	Std
	4	7/32" ± 1/64" Dimension "B"	4%	Three-way vernier caliper or depth micrometer	Std
	5	1.500" ± 0.000"-0.010" Dia "C"	4%	Adj snap gage - 1.500" go, 1.490" not go	Std
	6	1 5/16" ± 1/64 Dia "H"	4%	Three-way vernier caliper or 6" scale grad in 1/100th's	Std
	7	49/64" ± 1/64" Dimension "J"	4%	Three-way vernier caliper	Std
	8	1 1/8" ± 1/64" Dimension "M"	4%	Adj snap gage - 1.141" Go, 1.109" Not Go or three-way vernier caliper	Std
	9	5/64" ± 1/64" Radius-Dim "R"	4%	Set radius gages	Std
	10	1.496"- 1.503" Dimension "Q" across flats of hex in three places	4%	Adj snap gage - 1.503" Go, 1.496" Not Go or three-way vernier caliper	Std
		(See 6728014-16)			
	11	1.081" ± 0.000" - 0.003" Dia "C"	2.5%	Adj snap gage - 1.081" Go, 1.078" Not Go or 1" to 2" micrometer	Std

(contd)

Pack Parts to Prevent Damage & Corrosion. Receiving Sheet, Move Order, Etc., to Be Correct and Legible. Return Print & Gages Immediately.

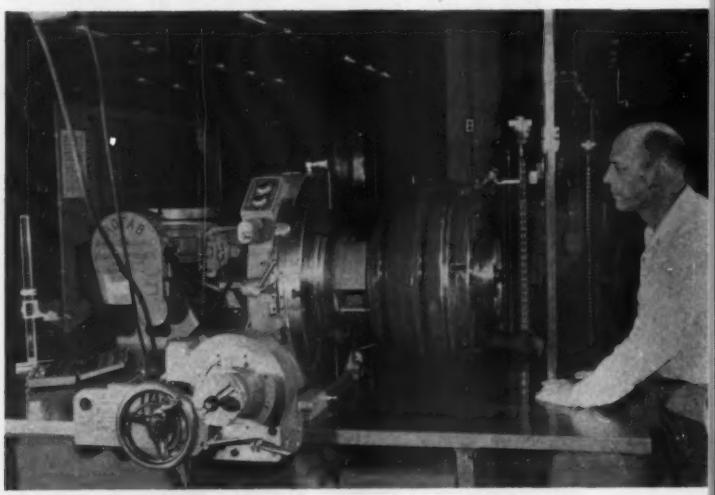
Written By – R E Sharpe | Prod. Engr. – O Z Jones | U.S.A.F. – A B See

Inspection procedures . . .

. . . have been prepared to standardize checking operations for all incoming parts and subassemblies, and to permit inspectors on succeeding shifts to check a complicated subassembly with confidence that operations previously checked off are correct. Each step is initialled by the inspector as it is completed. Sheets are corrected easily when engineering changes are made

Simple checking operations . . .

. . . are performed at workbenches: Parts requiring more complicated inspection operations and higher layout skills are routed to granite or CI surface plates where precision general-purpose equipment is available. For smaller parts, 12-in. tiltable Rotab rotary tables minimize setup and inspection time

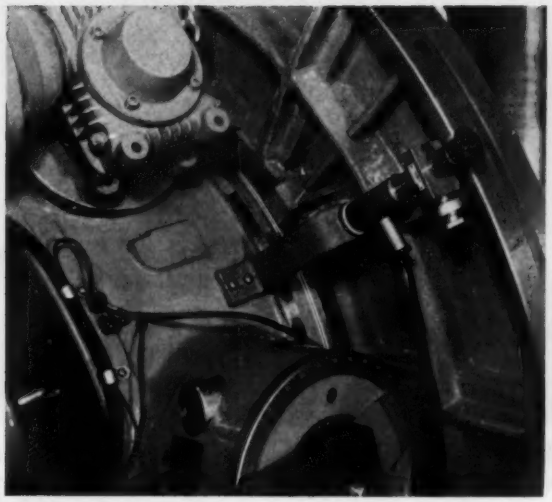


Larger parts and subassemblies . . .

. . . are assigned to 24- to 48-in. fixed and tiltable precision rotary tables, like this 24-in. tiltable P & W table on which a bearing-support assembly is supported by a special centering fixture so bolt-hole circles can be checked. Usually two or three tables are positioned on each surface plate

Tiltable rotary inspection tables . . .

. . . (Rotab 48-in. & 36-in.) are set on this 8 x 10-ft granite surface plate for checking sheet-metal subassemblies. The large chamber and nozzle assembly (left) later will be tilted to horizontal position for additional inspection operations. Fixtures hold the parts without distortion

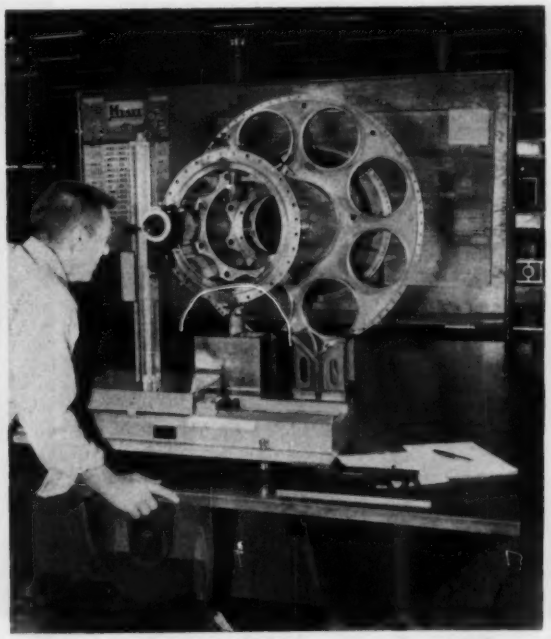


Micrometer microscope . . .

. . . mounted behind the rotary table of each of the larger Rotab tiltable inspection tables has a glass vernier reticle and is direct reading to 5 sec of arc on 360° graduated ring carried on table spindle assembly. Precise angular settings of table rotation and/or tilt also can be obtained with sine bars

Calibration of micrometer microscope . . .

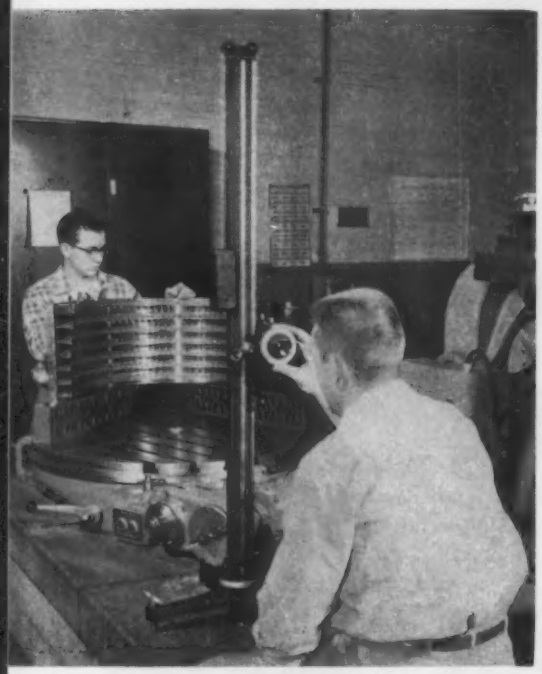
. . . and 360° graduated ring for angular settings of Rotab tables is checked in Allison plant with 18-in. Hilger & Watts auto-collimator, a right-angle prism, and a 12-sided, 30° polygon mirror (centered on table with magnet base). This setup can measure angles of rotation within 0.5 sec of arc



Where bolt holes and surfaces . . .

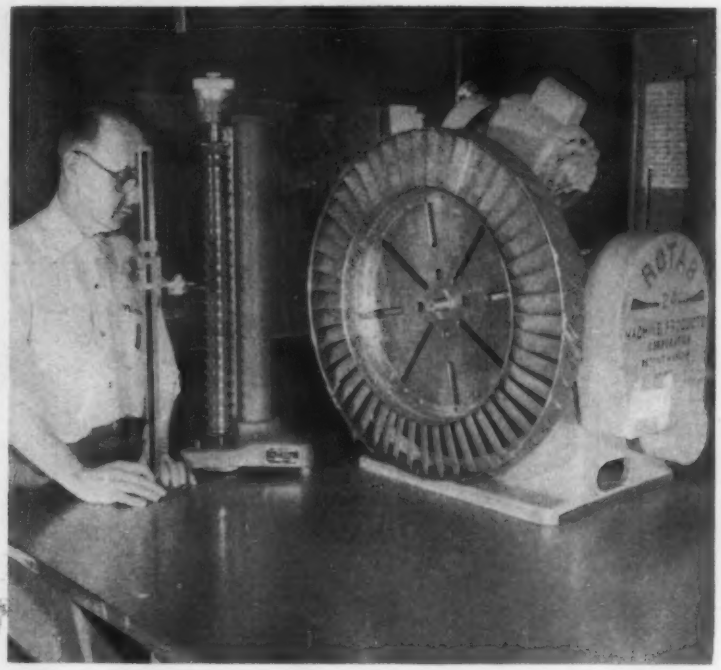
. . . are difficult to reach with height gages, a Gaertner coordinate cathetometer reads X-Y axis dimensions with optical accuracies. This instrument also facilitates checking bolt-circle holes where the engineers have given hole-position dimensions in coordinates

How Allison inspects vendor parts... *a special report*



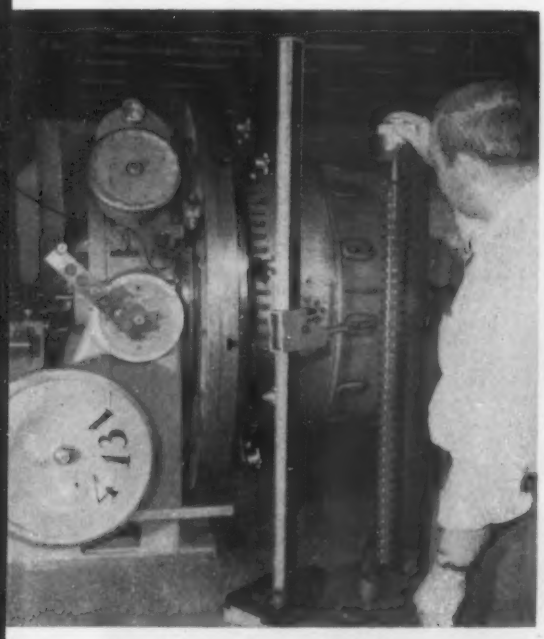
Equipped with a 360° vernier protractor head . . .

. . . this Gaertner cathetometer is teamed with a 42-in. P&W precision rotary table to check vane angle and spacing in turbine and compressor case assemblies. The instrument is sighted across center of table, which is rotated to bring optical sine-bar gage points into reading position



For most small and medium-size parts . . .

. . . checked on tiltable rotary tables, conventional gages are sufficient. Here, a 24-in. B & S height gage and a 24-in. Pla-Chek are teamed with a 24-in. Rotab unit to inspect a compressor-nozzle diaphragm. When only a few parts are to be checked, workpieces are clamped on face of table

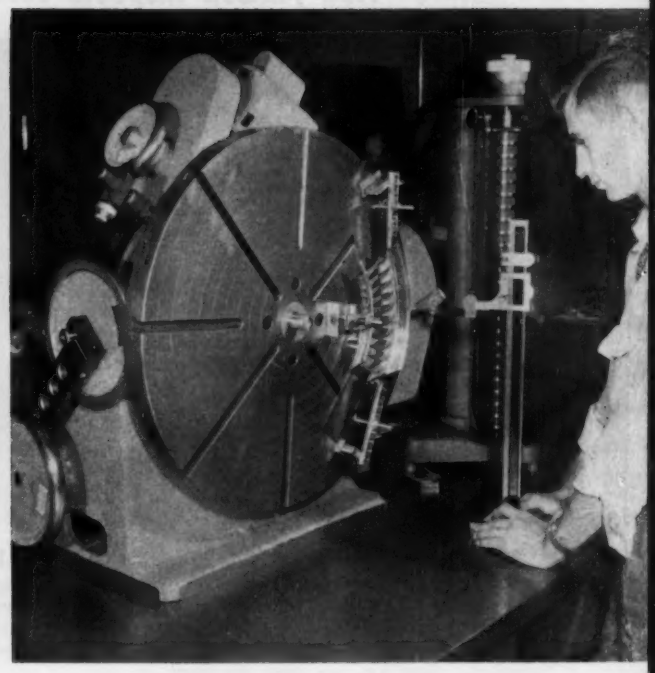


New 50-in. Tumico height gage . . .

. . . was developed to meet Allison's need for tall unit which would not sway from vibration while checking precision dimensions at considerable height above a surface plate. This gage has etched glass scale, easily read against white face of column, and extra-heavy base

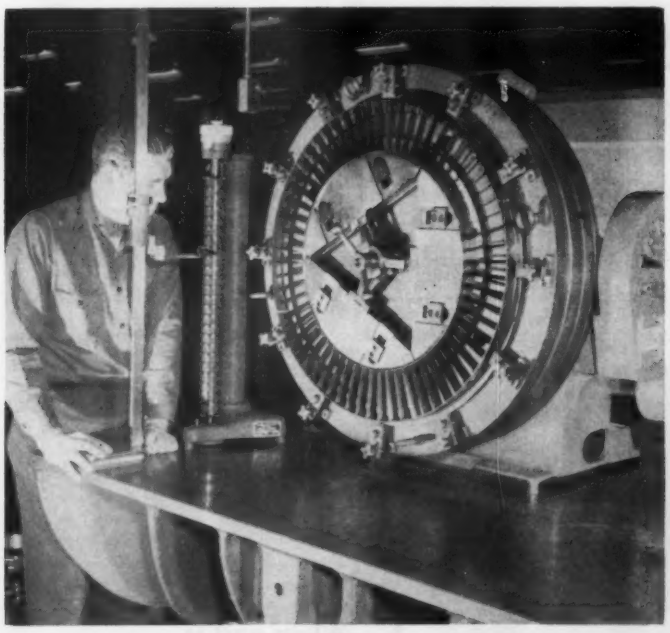
New Airmaster gage head . . .

. . . is mounted on 50-in. Tumico height gage for precision measurement on Precisionaire gage column of concentricity of mounting flange of aft-frame assembly supported on special expanding chuck and table of 36-in. Rotab unit. Rotab table is turned at 3 rpm under pushbutton control



Fixtures can save hours of setup time . . .

. . . when checking small parts on rotating tables. Before fixture was made, it took several hours to check each turbine vane segment (right) because each part had to be lined up with three centerlines and clamped before taking measurements. Centering fixture (left) makes it possible to check 11 dimensions on each of six parts in 30 min



Expanding fixture on table . . .

. . . of 36-in. Rotab simplifies checking of vane spacing in entrance guide-vane subassembly. Interchangeable jaws permit different parts to be centered

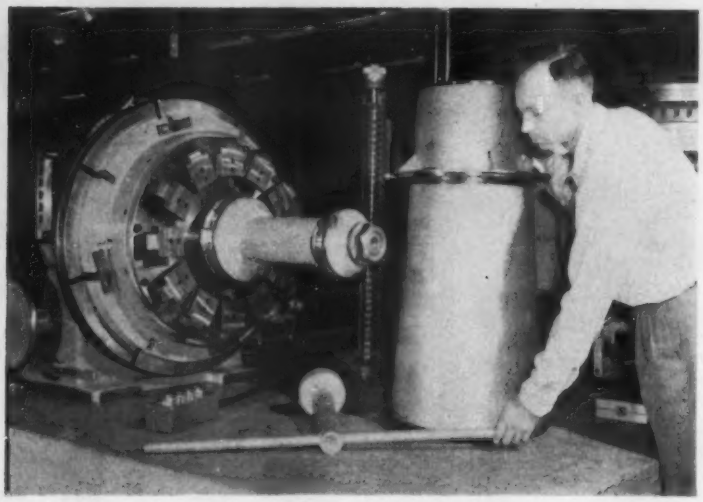
Flexible, thin-walled parts . . .

. . . like this 27-in. OD seal ring for a turbojet, are held in the shape they will be supported by other parts when assembled in the engine by chucking in multi-jaw Woodworth diaphragm chucks. The 16 jaws of this chuck can be interchanged with other jaws for clamping many different parts

How Allison inspects vendor parts... a special report

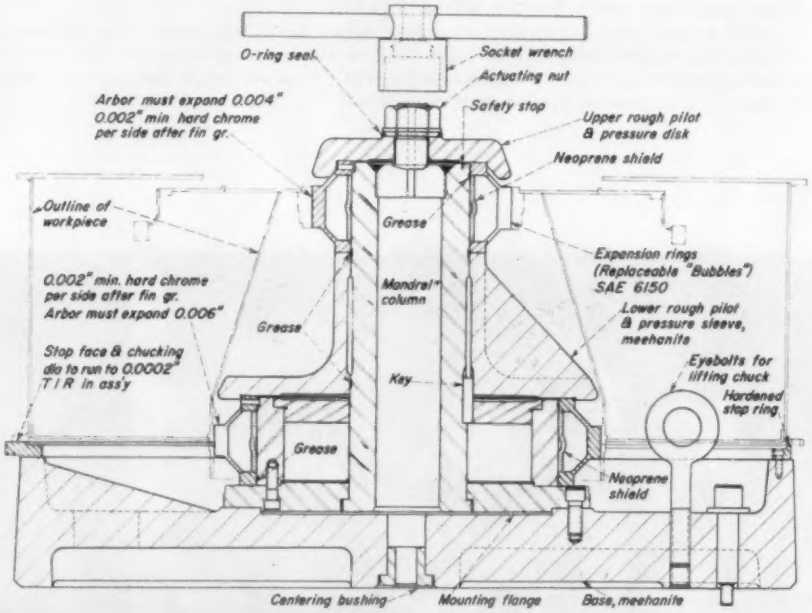
Made by mounting . . .

. . . 120 selected drill-guide bushings in 5 sides of a hollow cast-aluminum block, this tool permits setting dial bore gages 0.112 through 0.750 in. in 0.008-in. increments; from 0.750 through 1.250 in. in 0.020-in. increments. Cost was less than one-fourth of comparable master setting rings



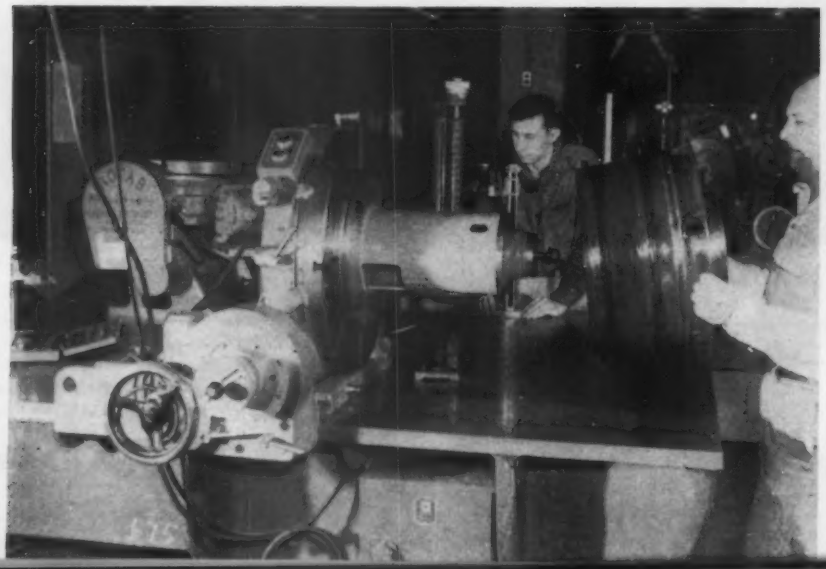
Aft-frame subassemblies for turboprops . . .

. . . are supported on novel Woodworth air-actuated diaphragm chuck with wrench-operated expandable two-position arbor (see sketch facing page, center). Part can be reversed on arbor so both ends can be checked with height gage. Chuck assembly usually is turned upright to facilitate loading



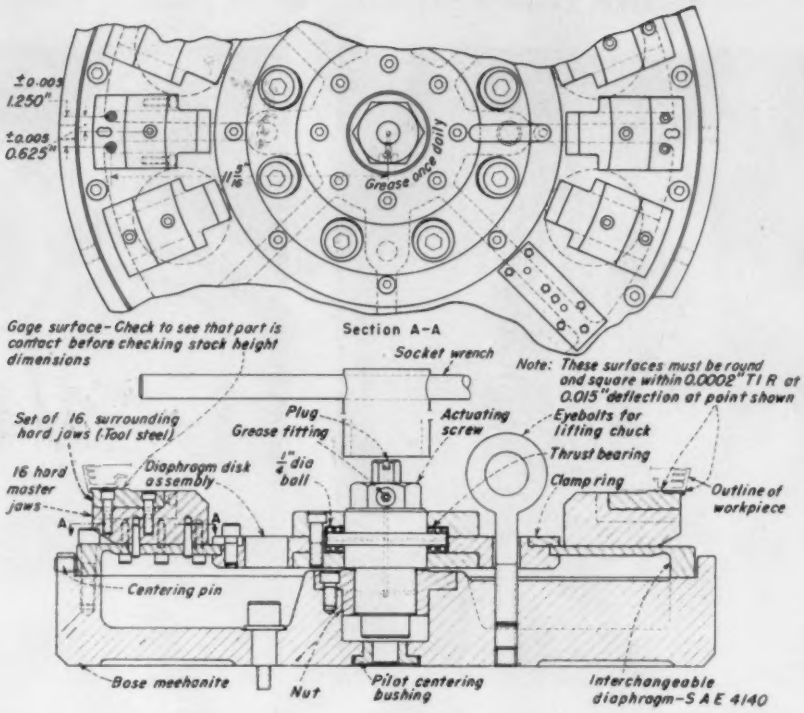
Socket wrench forces . . .

. . . pressure disk against 9- and 18-in. OD expandable diaphragm "bubbles" to center and clamp burner-support assembly for final inspection. Similar arbors can be used with jaw-type Woodworth diaphragm chucks when OD of a flange must be centered with ID of a bore in the subassembly



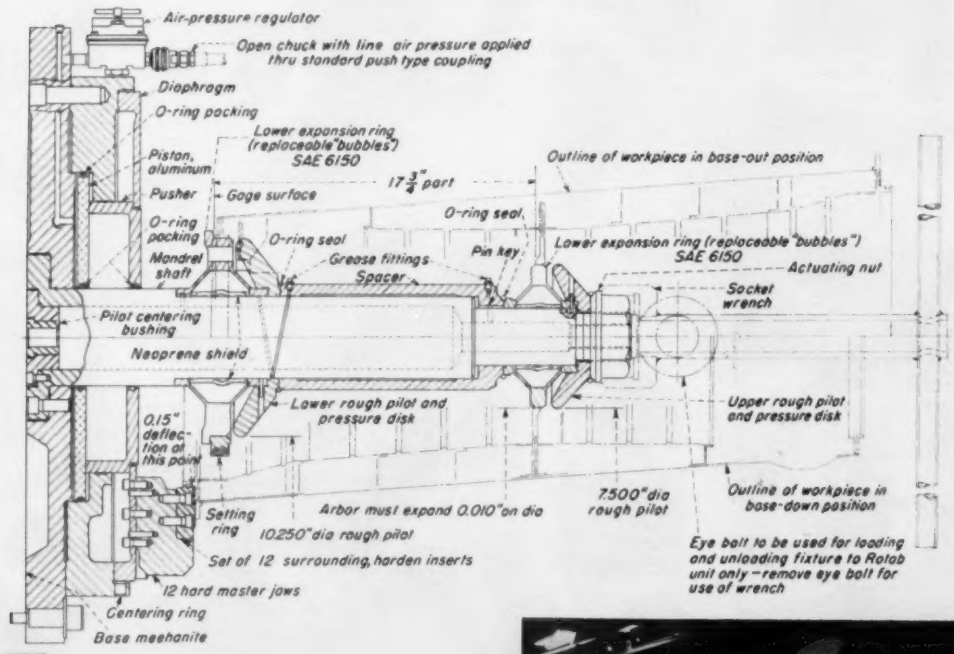
When part is sufficiently rigid . . .

. . . to be self-supporting, simple centering fixtures and clamps, as used to hold bearing-support assembly on this 24-in. P & W tiltable , are all that is needed in way of special tooling for many inspection operations



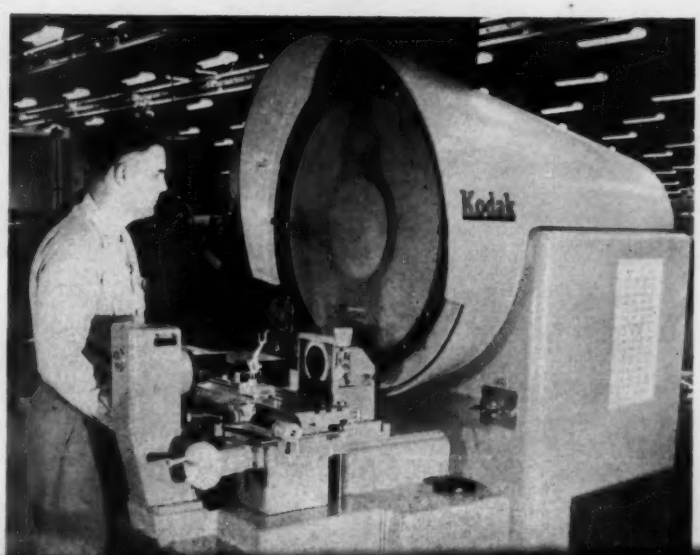
Interchangeable hardened tool-steel jaws . . .

. . . and diaphragms on this Woodworth wrench-operated diaphragm chuck permit internal or external clamping of workpieces or subassemblies 22.50 to 25.50 in. chucking dia. Concentricity of chucking is approx one-third of part dimensional tolerance—that is, if part is machined to a 0.003 in. tolerance on OD, chucking concentricity will be within 0.001 in.


Air-pressure regulator
Open chuck with line air pressure applied thru standard push type coupling
Diaphragm
O-ring packing
Lower expansion ring (replaceable "bubbles") SAE 6150
Piston, aluminum
Outline of workpiece in base-out position
17 3/4" part
Pusher
Gage surface
O-ring seal
O-ring packing
Mandrel shaft
O-ring seal
Grease fittings
Spacer
Pin key
Lower expansion ring (replaceable "bubbles") SAE 6150
Actuating nut
Socket wrench
Pilot centering bushing
Neoprene shield
Lower rough pilot and pressure disk
Upper rough pilot and pressure disk
0.15" deflection at this point
Setting ring
Arbor must expand 0.010" on dia
10.250" dia rough pilot
7.500" dia rough pilot
Outline of workpiece in base-down position
Eye bolt to be used for loading and unloading fixture to Rotab unit only—remove eye bolt for use of wrench
Set of 12 surrounding, harden inserts
12 hard master jaws
Centering ring
Base meehanite

Woodworth diaphragm chuck . . .

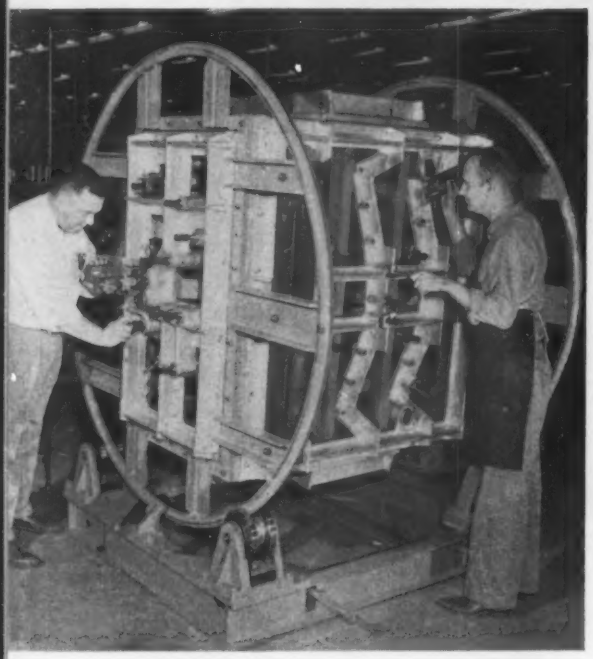
. . . for aft-frame subassemblies is arranged to center and hold workpiece in both base-out and base-in positions so both ends can be checked. Air-control system for 12-jaw diaphragm chuck can be set to apply predetermined chucking pressure evenly around periphery of workpiece to insure it is round



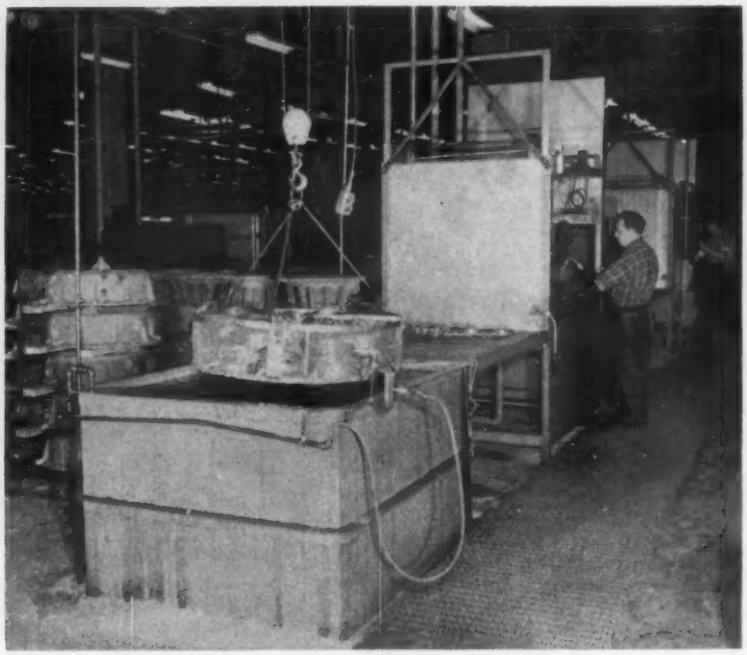
Another first-of-its-kind . . .

. . . in the receiving-inspection dept is this 30-in. Eastman optical contour projector. It speeds checking of many small parts to precision tolerances without requiring special gages

How Allison inspects vendor parts... *a special report*

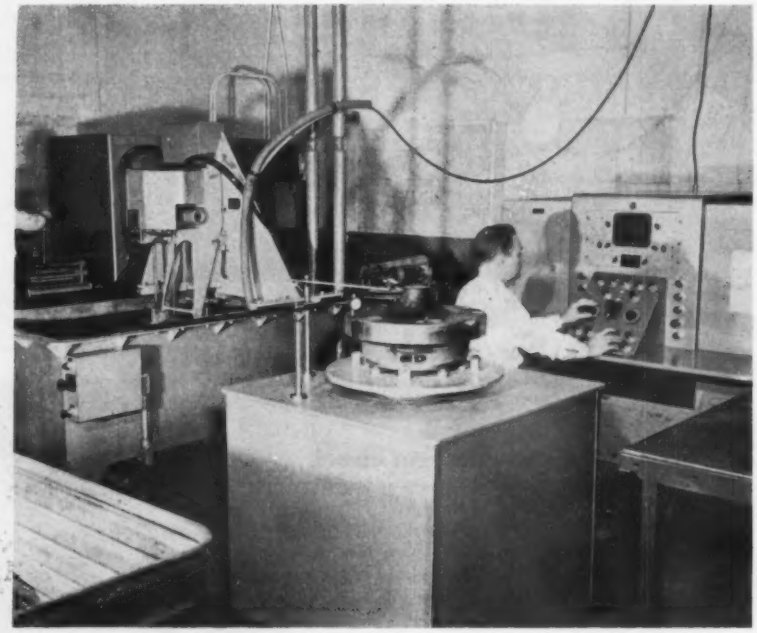


All unmachined castings . . .
. . . received from vendors pass through target-type qualification fixtures, to insure cleanup of all surfaces to be machined. Largest target fixture made to date (above) checks all six sides of a large magnesium-alloy casting. It checks more than 36 surfaces

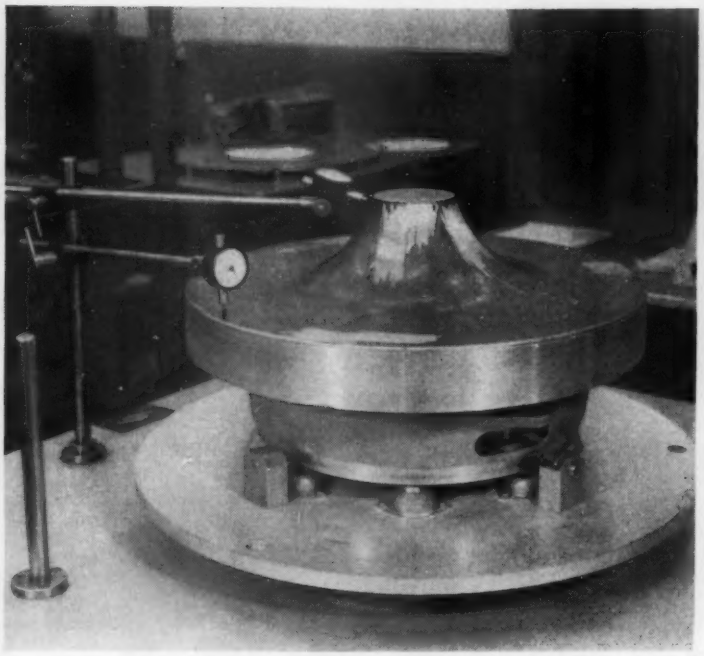


After targeting, all castings . . .
. . . and many weldments, are tested for cracks with a fluoresecent penetrant in one of several lines. Each line has a dip tank, a spray-wash booth, a drying oven, and an inspection booth—all connected by roller conveyors

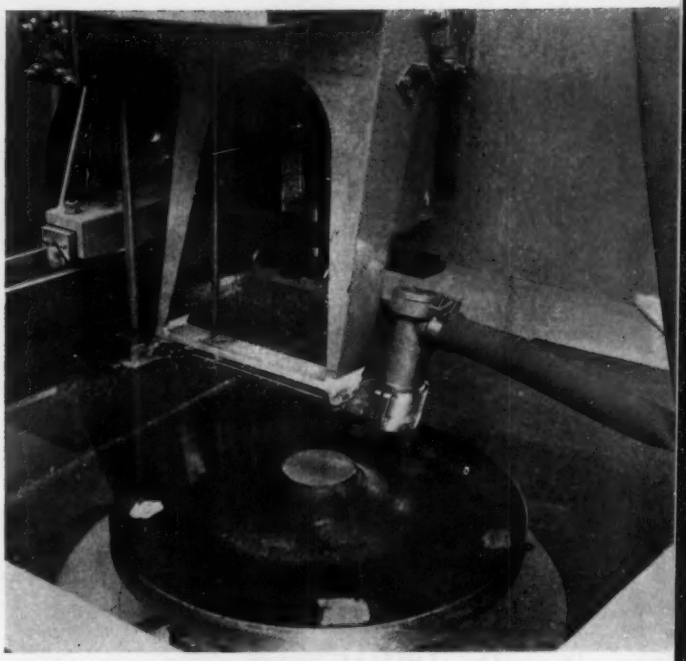
Efficiency of fluorescent-penetrant inspection of castings . . .
. . . has been increased by applying a high-frequency vibration for a few seconds immediately after lifting the part, or basket of parts, from the dip tank. Air vibrator is brazed to C-clamp as shown



First precision instrument . . .
. . . for simultaneously applying ultrasonics and digital automation to parts inspection, this Sperry SIMAC unit checks jet-engine rotor forgings and other unfinished engine parts for hidden flaws. Installation includes scanning unit, recorder, control cabinet, electronic monitoring console, and setup table

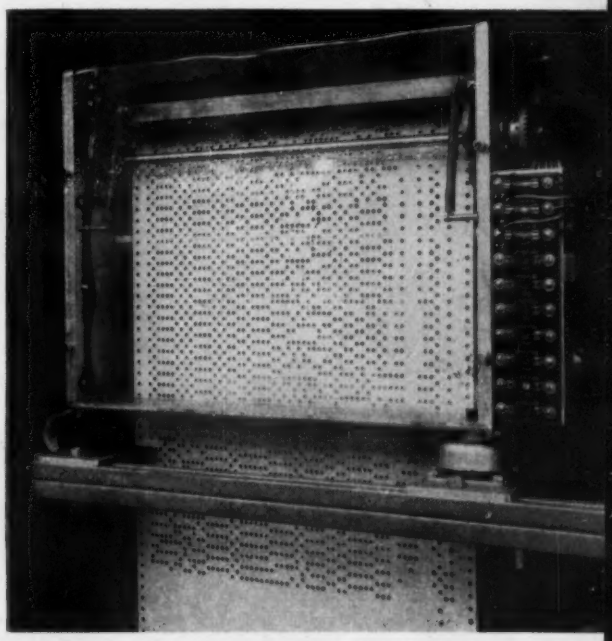


Setup table prepositions workpiece . . .
. . . in holding fixture before transfer to SIMAC inspection tank. Accurate setup is necessary so proper relationship will be maintained with programming system during ultrasonic examination of the workpiece



Turntable carrying prepositioned forging . . .
. . . is submerged in tank of water, then rotated under submerged scanning head which traverses the workpiece radially and tilts so ultrasonic beam enters the specimen perpendicular to surface of workpiece. Three precision servo-units drive scanning head under control of prepunched control tape

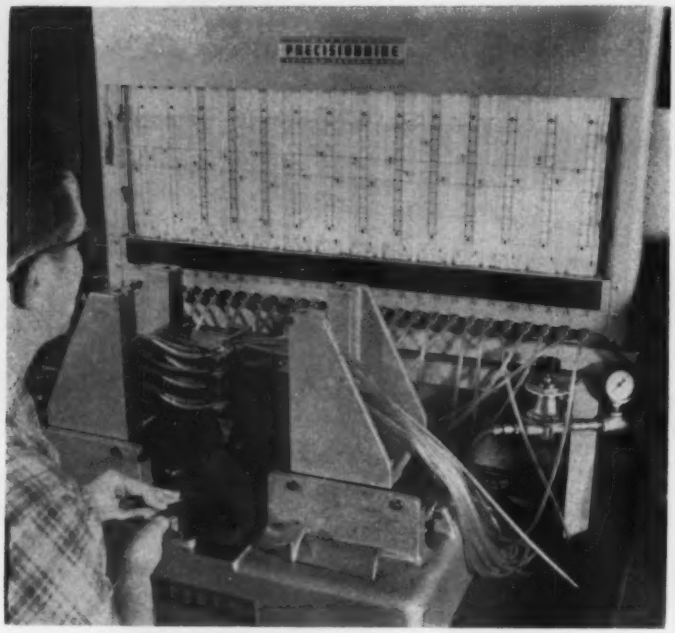
Each required motion of scanning head . . .
. . . in SIMAC automatic inspection machine is controlled by holes punched in wide paper tape with this unit. By a scheme which provides 12 holes for each function of the scanning machine, each servo-motor must seek one out of a possible 4096 positions in which to come to a rest. In all, 60 holes are prepunched in the tape for each scan line to be traversed by the unit



Punched tape in control cabinet . . .
. . . of SIMAC unit synchronizes action of drives, positioning devices and recorder. As test information is supplied on programming tape, it is analyzed, controls are put into action and data is fed to electronic control console for visual observation and manual control. Results are recorded on charts

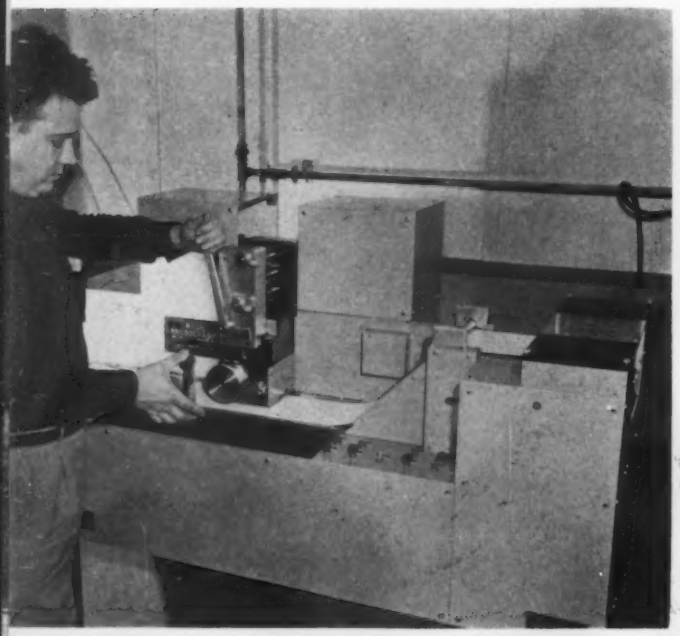
Recorder of SIMAC installation . . .

. . . makes a continuous plan view of the results of the ultrasonic test during the scanning cycle. It consists of a rotating table with a 28-in.-dia paper chart, and a recording pen. Chart becomes a permanent record of all ultrasonic echo signals amplified from the search unit as it checks a workpiece



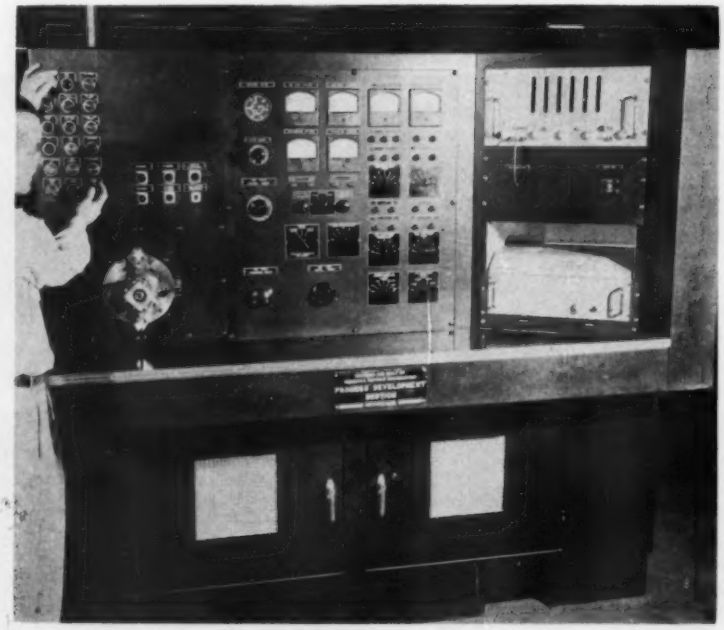
Turbine bucket forgings . . .

. . . for jet engines are purchased in such large quantities that high-production gaging equipment is used when checking them prior to machining. This 28-column Precisionaire air gage can be set to check any of a number of different sizes of blades by repositioning the air nozzles in the two supporting gage heads



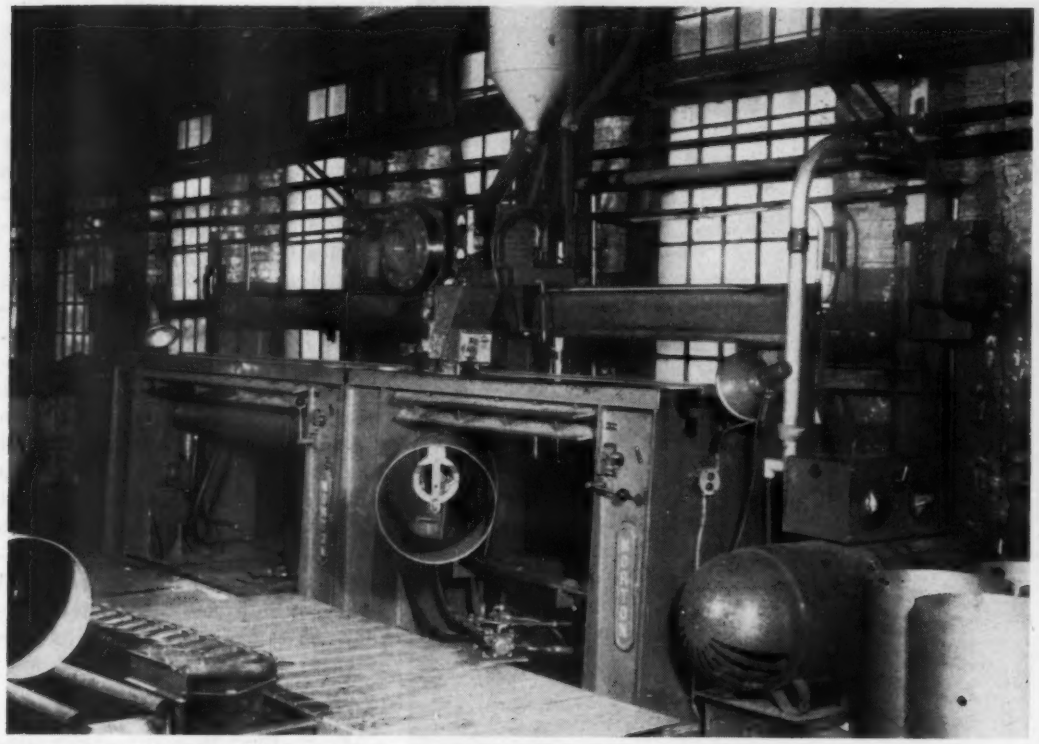
Latest of a number . . .

. . . of precision measuring and recording instruments installed in Allison's jet engine blade laboratory is this Probograph made by Warner & Swasey Research Corp. It automatically records on a moving tape the blade profile as measured with 21 probes. Blade is located against six pins when clamped in the gaging position



Designed and built . . .

. . . by GM Process Development Section this test stand does acceptance testing of a number of different speed sensitive switches. It uses a digital computer and is 20X as fast, and much more accurate, than previously used devices



TANK SHELLS are hand loaded and unloaded on hinged mandrels having water-cooled backup strips, and are seam welded automatically. One machine handles shells up to 42 in. long, the other up to 60 in. long

Mechanized tank production pays off

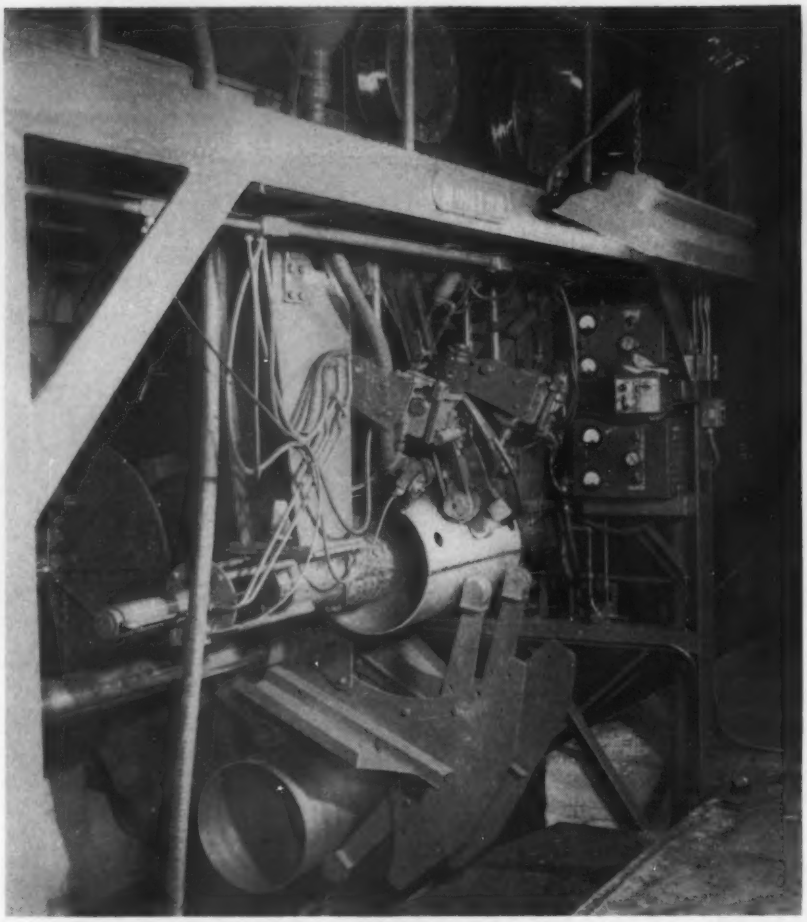
Unusual setup combines manual and automatic welding in a highly efficient, fully conveyorized production plant

GEORGE BAIN, district engineer, LINCOLN ELECTRIC CO, CLEVELAND

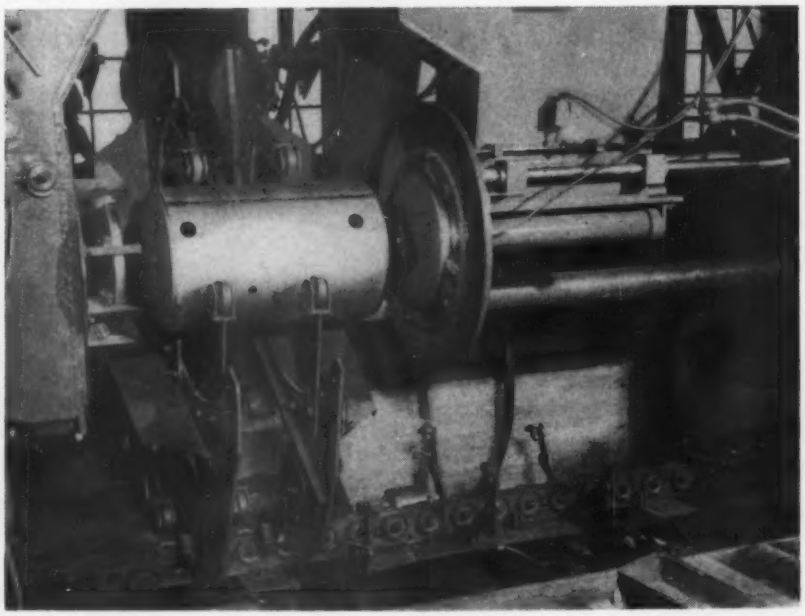
Careful attention to each detail of production has made the manufacture of galvanized tanks at the Three Rivers works of Fairbanks Morse & Co one of the most efficient setups in the country. Rather than go overboard on complete automation, the company has installed the best possible automatic equipment where this will pay off, retained manual methods where they are adequate. The entire process, however, is conveyorized with chain or gravity-roller equipment.

Standard sizes of tanks range from 3- to 120-gal capacity, in 11 sizes, all handled on the same equipment. Crowned heads and bottoms are blanked and drawn from strip in a single stroke of a 1500-ton hydraulic press. Stock is advanced along a roller conveyor,

HEADS AND BOTTOMS have spuds welded manually with 3/16-in. E-6012 coated electrodes. Production rate is about 40 welds per hr, sufficient for the welder to keep pace with automatic girth welder



GIRTH WELDING of tops and bottoms is performed automatically at second station of assembly machine as work is rotated on centers by belt-driven, rubber friction wheel. One center is water cooled, acts as ground



ASSEMBLY MACHINE picks up shell, positions it between two hydraulic rams which insert tops and bottoms from manually loaded fixtures under 700-lb pressure. If ends are loose, operator tack welds manually

scrap is severed by the die, and parts pushed from the die slide down a chute to the next press. The second, mechanical, press pierces the required holes in tops and bottoms which then go to a roll machine for crimping the flange. Finished parts are degreased and passed to the tank-fabricating line.

Shells are sheared to size from sheet stock, then fed by roller conveyor to a press for piercing. Rolling to cylindrical shape is performed on conventional rolls which have been fitted with a formed shoe at the back to bend the entering and trailing edges so subsequent press forming is not required. Shoes must, of course, be changed to suit varying tank diameters. The upper roll is hinged and can be raised by an air cylinder to permit removal of the formed shell.

AUTOMATIC SEAM WELDING

From four to eight shells, depending on diameter, are picked up from the floor by clamps hanging from cables attached to a trolley hoist, and are immersed in a hot alkaline solution for degreasing. Cleaned shells are stacked on the floor adjacent to Morton welding machines equipped with mandrels that swing out from a vertical pivot. On top of the mandrel is a water-cooled copper backup strip. Shells are manually positioned on the mandrel with the opening over the backup strip, and the mandrel is then swung in and locked parallel to the machine bed by an air ram. Edges are butted together and locked to the backing bar by copper shoes which rock down by levers when air is admitted to inflate collapsed air hoses under the outer ends of the levers. At the same time, small runout strips are clamped at the ends of the joint.

A Lincolnweld automatic head rides on a carriage on a beam track parallel to the seam and welds the joint by hidden arc at a speed of 60 ipm. No. L-60 mild steel wire, ⅛-in. dia, and No. 780 mild steel flux are fed automatically as the head advances. A vacuum system picks up unused flux and returns it to the hopper. When the weld is completed, the operator removes

the shell, breaks off the runout tabs, and places the part on a gravity conveyor.

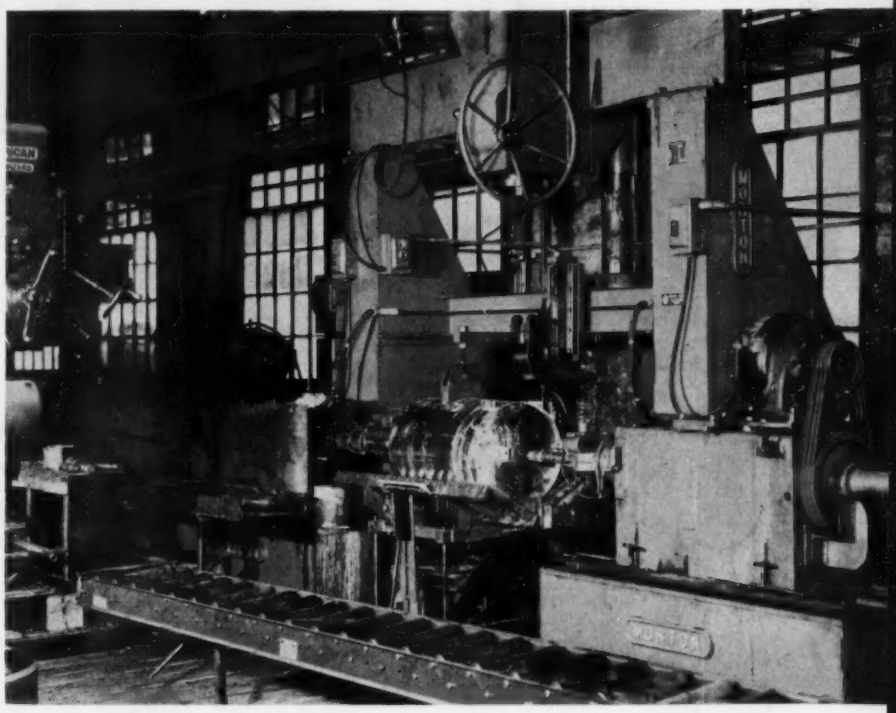
Manual welding is employed for attaching a spud to the central hole on tops and bottoms, the work being done on a power-driven, rotary fixture. Heads and bottoms are brought to the welder on a roller conveyor, then placed in a tote box for delivery to the girth welder.

ENDS ASSEMBLED AND WELDED

Shells advance along a roller conveyor and drop one at a time into a cradle below the welder. They then advance on rollers to a position from which they are elevated and picked up by an index fixture operated by pedal-controlled air cylinders. When the fixture indexes, the shell is aligned with two rams, one manually loaded with a top, the other with a bottom. These advance axially under 700-psi hydraulic pressure and press the head and bottom into the ends of the shell, leaving the flanges extending about ½ in. beyond the shell ends. The rams retract, and the assembly is indexed upward and over into welding position.

Lathe-type centers are advanced by air cylinders and engage the central spuds. One center acts as a ground and has a water-cooled grounding contact. Two automatic Lincoln heads swing into position, together with a rubber-tired driving wheel that is belt-driven and presses against the shell. Large hoppers above the machine feed L-780 flux automatically as soon as rotation begins and before the electrodes contact the work and strike the arcs. Two 600-amp dc generators each supply 550 amp at 25v for welding 10-ga ends to 14-ga shells. Rotation continues until the two girth welds, including a short overlap, are completed. After welding, the tank is indexed to unloading position and drawn out of the machine by a belt that carries it to a second belt, which delivers it to a gravity conveyor.

Final welding operations consist of manually welding spuds into the shell holes, welding on a hook hold, and attaching any bracket parts that may be called for. Anti-spatter compound is applied to adjacent surfaces so spatter will not adhere to exposed surfaces. Four welders, using 5/32-in. E-6012 electrodes, are required to keep pace with the girth welder.



AUTOMATIC TAPPING MACHINE taps holes in both ends of galvanized tanks. Wheeled fixture loads and positions work in machine, unloads it to conveyor for transfer to radial drill for tapping side holes

Before transfer to the galvanizing line, all holes are plugged and the tanks are tested under air pressure, using a soap solution to detect leaks. Plugs are then removed and the tanks suspended from a chain conveyor that carries them to the sulfuric acid pickle tank for a 4-min pickle at 160 F. Tanks are tilted during immersion to make sure that no air is trapped to leave areas untreated. After a hot water rinse, tanks are dipped for 4 min in a tank containing No. 20 galvanizing flux, salt, and sal ammoniac at 160 F. Tanks are drained and jarred to remove flux and water, then enter a vertical drying oven heated by the exhaust gases from the galvanizing fire.

As the tanks leave the oven on the chain conveyor, they are dipped into the oil-fired galvanizing tank and remain submerged for 2½ min at 860 F. All surfaces, both inside and outside, are coated with the molten zinc, a 20x32-in. tank picking up about 4 lb of the metal. Tanks cool quickly and are unloaded onto the floor, where any drip is filed off. They are then loaded onto a roller conveyor that carries them to a tapping machine. Each tank is unloaded into a wheeled fixture that moves transversely into the machine until the central end holes come into line with horizontal spindles which advance and tap them. The tank is then shifted under a radial drill for tapping all side holes.

A roller conveyor carries completed tanks to inspection stations where the inside is visually inspected and any loose particles removed by a vacuum hose. At the second station, an air wrench screws plugs into the various openings, and hydrostatic spot checks are made for leaks. A motor bracket is hand welded to the bracket supports at the third station. This is a box structure, separately fabricated and galvanized, and is welded on with 5/32-in. rod which gives a strong weld despite the galvanized surfaces. Weld areas are painted, and the assembly wiped clean and fork-trucked into a boxcar for shipment.

Round Table

"Dear Employee..."

"That company letter they sent out yesterday is a hot one, Al. Did you get your copy last night?"

"Sure, Ed. I hope it got the point across. It's going to be tough enough around here without having to kill wild rumors and explain in detail to each man just how it isn't true that everyone's going to be out of a job."

"That's the trouble, Al. I think a letter's a darned poor way to tell the people in the shop that we're getting in some new machines, and, as a result, there will be some job reshuffling."

"What did you expect, a mass meeting with all the execs on a platform?"

"Well, why didn't they use the company paper, or the bulletin board? Or why not the normal route for such information—the foremen? Seems to me a letter will create a shock, and leave a lot of room for confusion, too."

"That letter's a pretty good job, Ed. I suppose they worked on it for several days before it got an OK. It really does explain the whole new program, if you'll take time to read it."

"That's the trouble, Al. You have to take time to read it, and your own time. The letter competes with radio and TV, and the newspaper, too. I'll bet not half of the men read it all the way through."

"Look, Ed. That's pretty important stuff; I'd stake a week's pay that everyone who got it will read most of it. Besides, it's addressed to each employee, personally."

"Big deal! They got out the stencil machine, or whatever they use. The trouble is, the letter brings up as many questions as it answers. We're going to have to answer them, Al."

"OK, start answering. You know as much about it as I do. The point is, the men know roughly what's going to happen, and all we have to do now is clear up their personal questions."

"Well how do I tell each man if he's going to stay on the same machine or the same job when I don't know myself?"

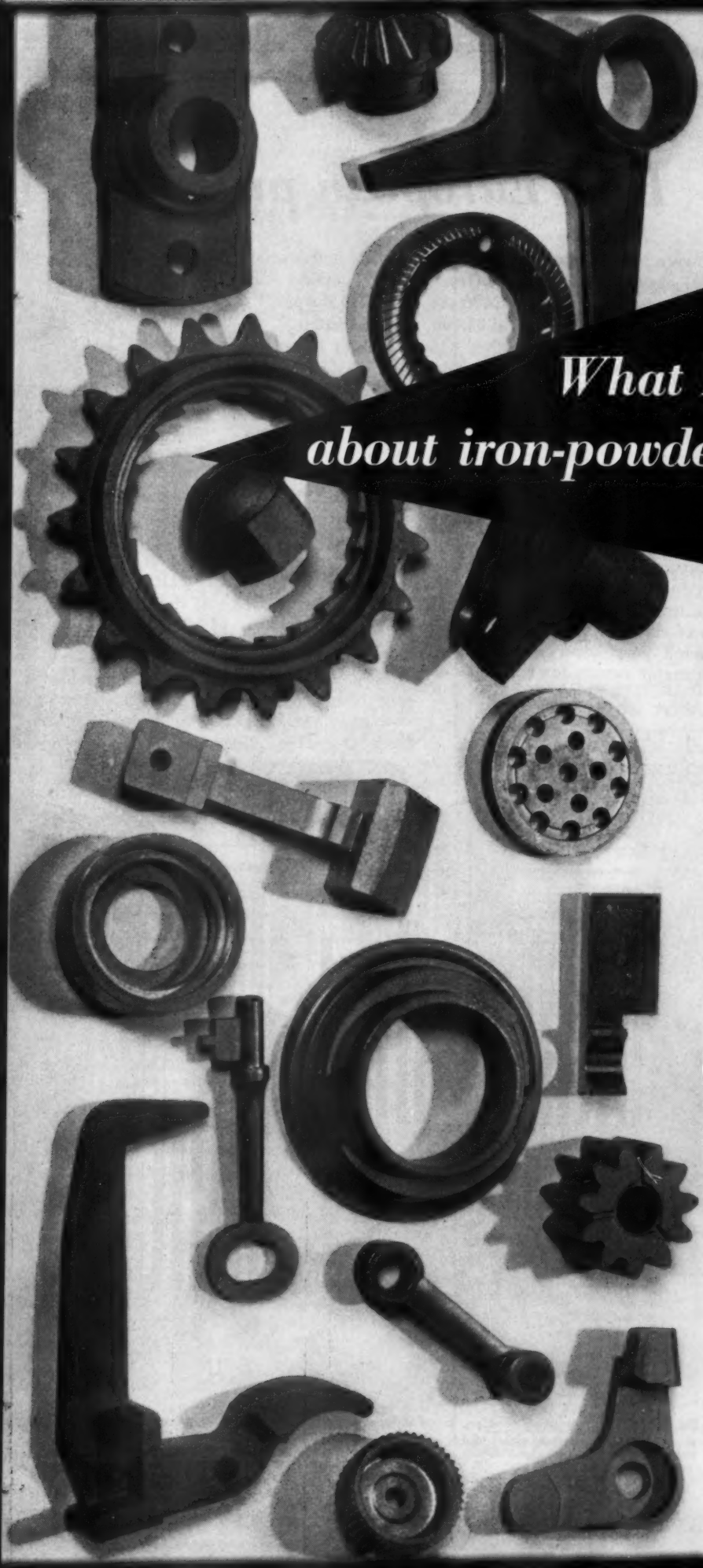
"You don't. Just tell them what you know for a fact so far, and ask them to keep their shirts on for the rest of it. The company will keep them informed."

IS a company letter a discreet way to tell the working force about major changes coming up? Should such information be given out by the foremen, the newspaper, or on the bulletin board? Can a regular series of employee letters do a better job of telling the men than older methods? Your opinions may help others with this problem. Discussions of earlier topics start on page 204.

What Europe knows about iron-powder metallurgy . . . A SPECIAL REPORT

American Machinist

SPECIAL REPORT NUMBER 394



What Europe knows about iron-powder metallurgy

SVEN I HULTHÉN,
metallurgist,
Metallurgical & Abrasive Products Division,
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It's often true that European practice is of little interest to American shops because of the difference in production levels and methods. But occasionally an overseas engineer is in a position to "tell all" about developments that have a bearing upon our needs. Such is the case with this Special Report, derived from a paper presented before the annual meeting of the Metal Powder Association, in Philadelphia on May 10-12. We give you here the facts discovered abroad about high-strength, close-tolerance, difficult-to-make parts currently being pressed in Europe from high-quality iron powders. Further, we give you the details of the German tooling system, which is particularly well adapted to parts having several projections in the direction of compacting.

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How European practice

Iron-powder metallurgy in Europe was a curiosity until shortly before the last war.

Few people were aware that German pioneering would result in replacing thousands of tons of copper shell driving bands by sintered bands, thus saving strategically important copper for the Axis' forces.

Because of rapid development in the low-density field, German powder metallurgists made great efforts to manufacture parts for small arms and similar mass-production articles. This work called for the development of high-grade sintered steels.

The outstanding contribution to powder metallurgy, however, was the development of the German tooling system at Hermsdorf. This tooling system will be described.

When the war ended, activity in iron-powder metallurgy stopped temporarily in Europe, except for Austria, England and Sweden. During the 1947 to 1950 period, activity was confined largely to development. In these years a number of new plants were started in several European countries.

USE OF IRON POWDERS IN EUROPE

Five types of iron powders are now available on the European market:

1 . . **Reduction powders (sponge iron powder)**
2 . . **Atomized powders**
3 . . **Eddy-milled ("Hametag") powders**
4 . . **Electrolytic powders**
5 . . **Carbonyl iron powder.**

Estimated consumption of iron powders for various purposes in 1954 was:

Usage	Metric tons
Welding electrodes	**6,800**
Powder metallurgy	**3,200**
Chemical purposes	**1,350**
Flame cutting and scarfing	**850**
Seed cleansing	**200**
Miscellaneous purposes	**100**
Total	**12,500**

Current production capacity of producers in Austria, France, Great Britain, Italy, Sweden and Western Germany is estimated at 33,000 metric tons annually.

On the 3,200 metric tons annually consumed by powder metallurgy, nearly 20% is electrolytic iron powder, and another 40% is sponge iron powder. These relationships emphasize that the trend towards high quality is probably more accentuated in Europe than elsewhere.

European designers and production engineers have a critical attitude towards the physical properties of sintered machine parts and demand very accurate tolerances. The major reason for emphasis on quality and precision may be found in the general scarcity of raw material in Europe.

RAW MATERIALS

Tables 1 and 2 include chemical and physical data as well as sintered properties for some important types of iron powders. As a comparison two well-known American iron powder grades—Ancor 80 and Pyron—have been included. On the whole, the qualities of these electrolytic powders —"Standard" excepted—can be considered as fairly equal in application to low-density parts.

The picture changes if the problem is manufacture of high-density parts, and, to some extent, also for the upper range of medium-

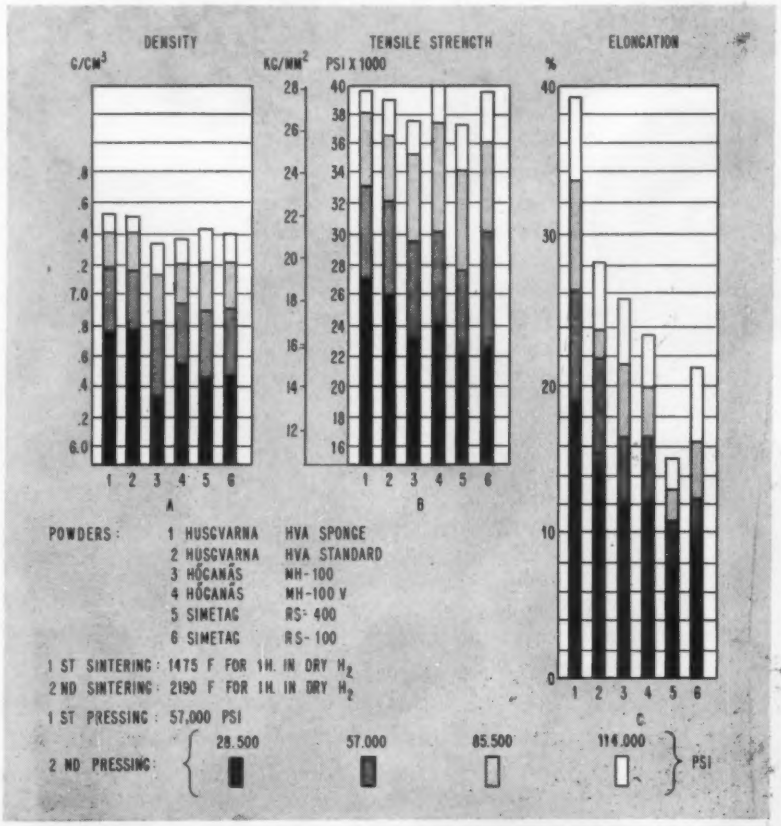


Fig 1 . . Various European powders show different response in respect to density, tensile strength and elongation after double pressing and sintering

got started...

density parts. In this case, the superiority of electrolytic powder is clearly demonstrated by Fig 1. In each case, one must know the economical justifications for using high-priced electrolytic powder.

European demand for a powder suitable for high-density applications has resulted in development of a sponge type of iron powder with an apparent density of about 2.8. This type of Höganäs sponge-iron powder has been called "MH-100 V", Fig 1. Generally speaking, this powder shows improved compressibility when compared with the standard MH-100 grade, but green strength is decreased. Sintering activity is also somewhat inferior, which calls for increased sintering temperature and/or sintering time. When mixed with copper, this powder appears to yield excellent mechanical characteristics after sintering, although it is still too early to give accurate figures.

PRE-ALLOYED POWDERS

As yet, no pre-alloyed powder has been developed for mass production of mechanical parts. In Europe, as in USA, the general opinion is that pre-alloyed powders have poor compressibility characteristics.

Experiments carried out at La Metallurgie des Poudres in Paris and at Höganäs-Billesholms Aktiebolag indicate, however, that there may be a chance that a pre-alloyed iron-copper powder with low content of copper might offer some advantages.

Fig 2 shows the relationship between the copper content and compressibility for pre-alloyed copper powder and mixtures of iron and copper powders. The excellent compressibility in the 2%-3% copper range is clearly demonstrated.

The 2.5% iron-copper material, when properly sintered and precipitation hardened, yields tensile values exceeding 50,000 psi. Further, when compacted from pre-

table 1—**TYPICAL ANALYSES OF IMPORTANT IRON POWDERS**

Manufacturer	Höganäs		Pyron	Simetag	Husqvarna[1]
Marking	MH	Ancor	—	RZ-400 RZ-100	—
Type	Reduction Powder			Atomized	Electrolytic
Analys:					
Fe abt. %	98	98	98	98.5	99
C "	0.1	0.10	0.02	0.10	0.05
O "	0.8	0.75	1-1.5	0.80	0.5
SiO_2 "	0.2	0.15	0.20		
Si "				0.10	0.02
S "	0.015	0.04	0.004	0.03	0.01
P "	0.015	0.01		0.03	0.01
Mn "			0.35	0.02	0.06

[1] I. Ljungberg *"Herstellung und Eigenschaften von Elektrolyteisenpulver"*, Stahl u. Eisen, h. 5, Feb 1954, p. 279-285

table 2—**PHYSICAL DATA AND STRENGTH OF EUROPEAN IRON POWDERS**

Manufacturer	Höganäs		Pyron	Simetag	Husqvarna	
Marking	MH-100	Ancor 80	—	RZ-150	HVA	
					Standard	Sponge
Type	Reduction Powder			Atomized	Electrolytic	
PHYSICAL DATA						
Screen Analysis, US Std Mesh:						
70 Mesh %					1-5	
100 " %	max. 1	abt. 1	abt. 17	abt. 11	10-20	1-5
140 " %	20-30	" 18	" 27	" 24	20-30	10-20
200 " %	25-35	" 20	" 20	" 20		
230 " %	3-10	" 10	" 4	" 14	20-30	25-35
325 " %	10-20	" 15	" 11	" 17		
325 " %	abt. 20	" 35	" 21	" 14	25-35	30-50
Apparent Density[2]	abt. 2.4	2.2-2.3	2.2	" 2.5	3.2-3.3	2.6-2.8
Flow[3]	" 30	30-34	35	" 24	25-27	30-32
Compressibility[4]	6.3-6.4	abt. 6.2	abt. 5.9	" 6.2	6.7-6.8	6.4-6.6
TENSILE STRENGTH and ELONGATION						
Tensile strength, psi:						
At sintered density = 5.5 g/cm³	9,900	14,200	14,200	7,800	—	14,200
At sintered density = 6.2 g/cm³	17,000	21,300	21,300	17,000	12,800	22,750
Elongation, %:						
At sintered density = 5.5 g/cm³	5	6	6	4	—	6
At sintered density = 6.2 g/cm³	8	9	8	8	2.5	8

[1] and [3] expressed in g/m² and sec./50 g according to MPA Standards. [4] Expressed as pressed density at a compacting pressure of 4 tons/cm² (= 57,000 psi)

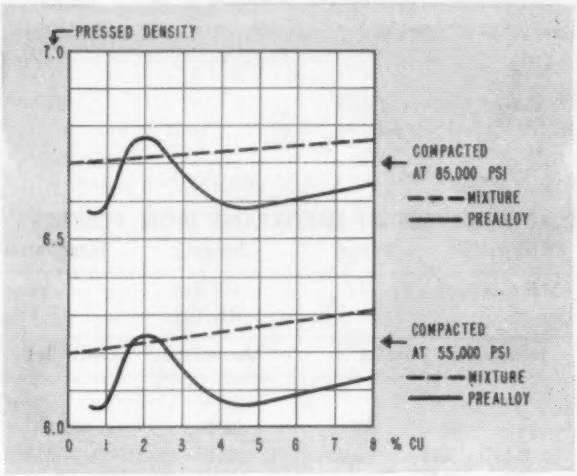


table 3— **DIMENSIONAL CHANGES AFTER SINTERING AND SINTERED PROPERTIES***

POWDER	A MH-100	B MH-100 +7.5% Cu	C MH-100, prealloyed with 2.2% Cu
Dimensional Change, %	−0.2	+1.8	−0.2
Sintered Density, g/cm³	6.6	6.7	6.7
Tensile Strength, psi	21,000	40,000	45,000
Elongation, %	8-9	2	3.5

* Compacting pressure—85,000 psi; sintering conditions—1 hr at 2100 F in hydrogen

Fig 2 . . Compressibility of a pre-alloyed powder is excellent if the copper content is 2 to 3%

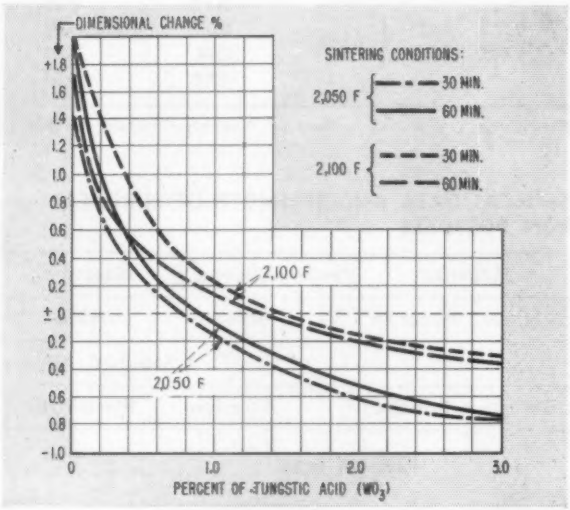


Fig 3 . . Tungstic acid affects dimensional changes of a mixture of 92.5% MH-100 iron powder and 7.5% atomized copper powder compacted at 60,000 psi and sintered in dry hydrogen

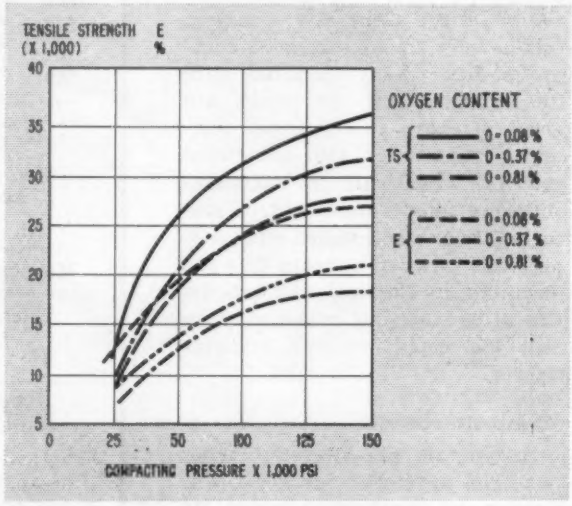


Fig 4 . . Oxygen content of the powders affects tensile strength and elongation

alloyed iron-copper powder, this material is "non-growing" during sintering. It is also readily adaptable to casehardening and yields an excellent fine-grain matensitic structure.

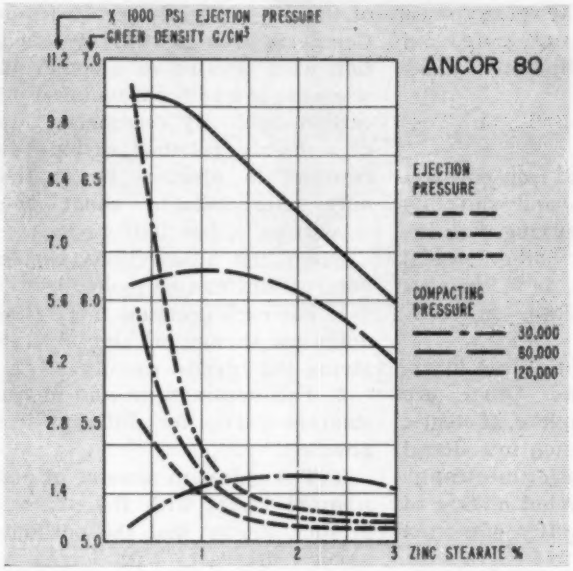
Table 3 indicates dimensional changes and sintered properties for test bars, which have been prepared from standard iron powder, a mixture of iron powder with 7.5% commercial (untreated) electrolytic copper powder of H150 mesh, and, finally, from iron powder pre-alloyed with 2.2% of copper.

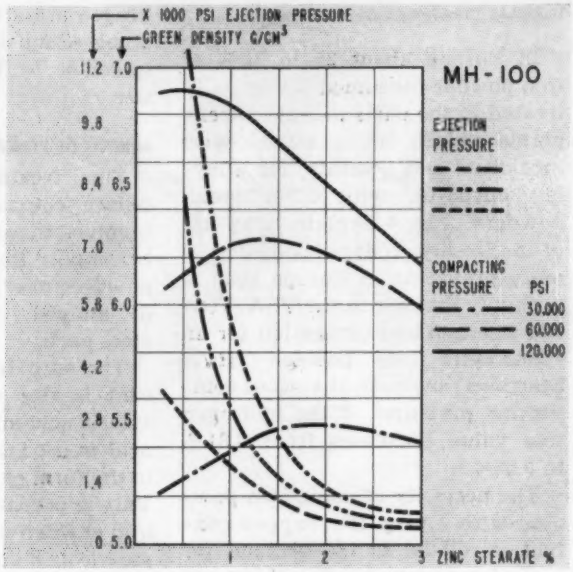
It should also be mentioned that it is possible to obtain non-shrinking properties when sintering mixtures of about 2.5%-300 mesh, freshly reduced electrolytic-copper powder and sponge-iron powder. If a coarser copper powder is utilized, or if it has been oxidized to some extent, the tensile strength may drop to about 28,000 to 38,000 psi, and the growth may exceed 1.5%. The main advantage, therefore, in using a prealloyed iron-copper powder is that it would not be so sensitive to oxidation, and that it would show shrinkage instead of growth during sintering.

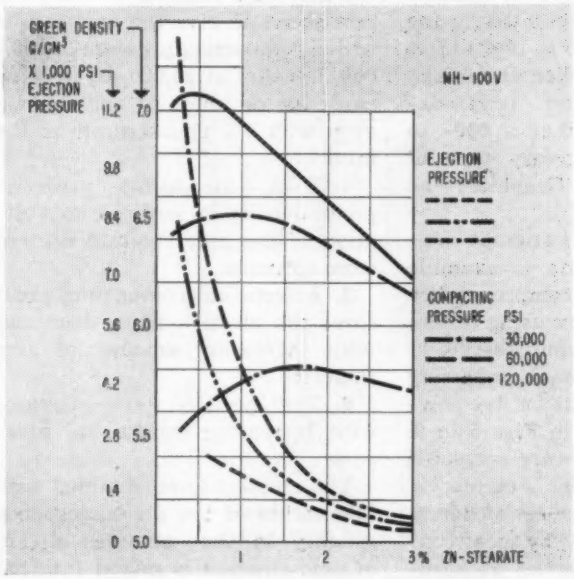
Excessive growth, which occurs when MH-100 is sintered with copper-powder additions, can be eliminated if small quantities of tungsten powder or tungsten compounds are added to the iron-copper mixture.

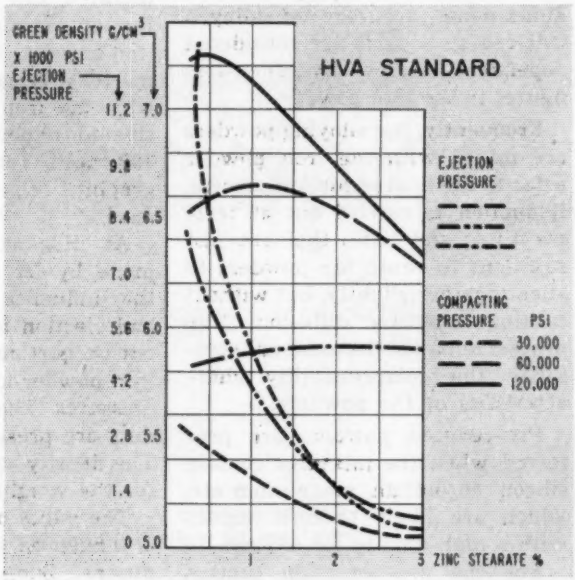
Fig 3 shows the effect on dimensional change by varying additions of tungstic acid to a mixture of 92.5% MH-100 and 7.5% atomized copper powder. The powder mixtures were compacted at 60,000 psi and sintered at different temperatures and for different lengths of time. Addition of tungsten has a remarkable influence on the tensile strength as tabulated:

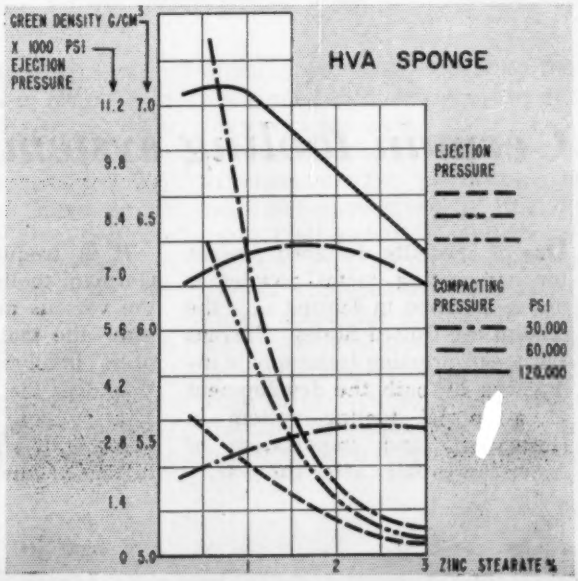
WO_3%	Tensile Strength
0.0	41,500
0.25	48,000
0.50	53,000
0.75	55,000
1.0	57,500
2.0	60,000











Figs 5 to 9.. Different proportions of zinc stearate as a lubricant affects the green density and ejection force for compacts. Charts give results for five powders

THERMAL TREATMENT OF POWDERS

In Europe about 25 to 30% of iron powder consumed is thermally treated in the parts manufacturers' plants before being mixed with lubricants and possibly, for alloying purposes, with other metal powders. Fig. 4 explains why use of a freshly reduced powder is more prevalent in Europe than is probably the case in the USA. Tensile strength and elongation for an electrolytic iron powder (HVA Standard) increase at various compacting pressures, if the hydrogen loss value decreases from 0.81% to 0.08%[4].

The necessity of using iron powders with a very low oxygen content is related to the demand for high-duty parts by the European market. Mechanical properties and dimensional accuracy of alloyed sintered-steel parts are considered dependent on low hydrogen-loss figures in the iron powder.

Frequently, the alloying powders are mixed with the iron powder prior to the final reduction process. Reduction is carried out at temperatures and times that are just sufficient to cause the powders to stick together slightly, but without causing extensive diffusion. The process must not decrease unnecessarily the compressibility characteristics of the powders.

Pre-reduced powders are preferred when the mixtures contain silicon, chromium, magnesium etc, which are likely to form oxides with a high affinity for oxygen.

For the pre-reduction process described, cracked ammonia or hydrogen are used. The spongy mass obtained must be disintegrated and screened to the stipulated mesh size.

MIXING OF POWDERS

Final treatment of iron powders before compacting and sintering involves thorough mixing with lubricants. Possibly other metal powders are added, as in the case of alloyed, high-duty, sintered-steel parts.

The most frequently used lubricant is zinc stearate. Others are stearic acid and graphite. If stearic acid is used, it is often introduced in the form of a "master lubricant." This is prepared by hot mixing of iron powder and 5 to 10% of molten stearic acid and 2.5 to 5% graphite. After cooling, this mixture is disintegrated and screened at least to the same mesh as stipulated for the iron powder. From 5 to 10% of this master lubricant is then dry-mixed with the iron powder. It is considered important that a 200- to 300-mesh, rather greasy type of graphite (Ceylon Graphite) be used.

At Höganäs an attempt was made by Dr Brundia to examine the influence on compressibility and ejection force by using different proportions of zinc stearate to iron powder at various compacting pressures. The results for five powders are presented in Figs 5 to 9. The density values were corrected for the weight of zinc stearate.

The value of the ejection forces is influenced greatly by local conditions. Such properties as hardness, elasticity and surface finish of the die material are important. Compacts used for this investigation were pressed in a somewhat worn die of a 13% chromium-1.8% carbon steel. By comparison, use of a highly polished carbide die resulted in ejection forces that only amounted to about one-seventh of those indicated.

From the illustrations certain observations can be made:

1. For each pressure there is an optimum amount of zinc stearate giving the highest density.

2. This optimum amount of zinc stearate varies for different iron powders.

3. The optimum amount of zinc stearate varies with the pressure in such a way that the optimum amount decreases with increasing pressure. Thus, it can be seen from the diagrams that 0.5% zinc stearate seems to give the best results with a compacting pressure of 120,000, but that at 30,000 psi in some cases the optimum is not reached even with 3% zinc stearate in the mix.

4. With increasing pressure, green density is sensitive to variation of the zinc stearate content from optimum.

5. At constant compacting pressures the ejection force decreases with increasing amount of zinc stearate.

6. The ejection force increases with increasing compacting pressure.

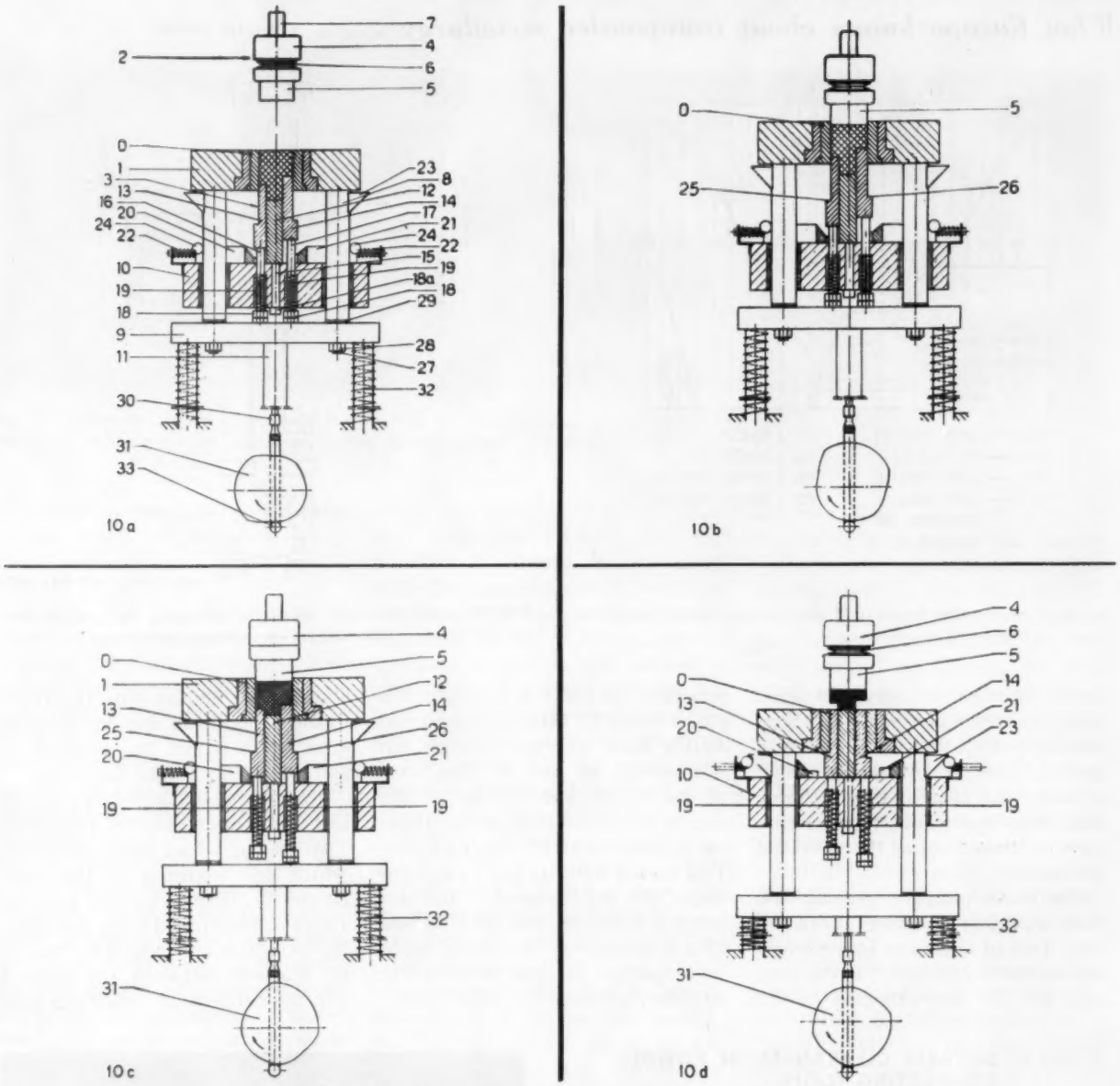
The ejection force obtained with lubrication of the die corresponds roughly to that obtained if 1% of zinc stearate is mixed into the powder.

German tooling system makes precision parts

Use of specially designed presses for compacting metal powder is not so common in Europe as is the case in the United States. Current European pressing technique is influenced by both the development of a special tooling system in Hermsdorf, and importation of American presses after the war.

It is frequently said that the German tooling system, wherein the various movements are "built into" the tool instead of into the press, involves more complication than does the American technique. This opinion should probably be taken with a pinch of salt. Manufacture of fairly symmetrical parts with low- or medium-density values, with not more than two or three projections in the pressing direction, and with moderate demands for dimensional precision in such pressing directions, will be more economically performed in an American press.

On the other hand, if high-den-



Figs 10*a* to 10*d* . . Cycle of operation for German tooling system: At *a*—Fill position: At *b*—upper punch has entered die, and simultaneous downward movements of die, upper punch and lower punches has commenced: at *c*—pressing position, with auxiliary punches stopped by side cams, upper punch continues downward until compacting is completed, and at *d*—die and auxiliary punches are withdrawn, part is held between stationary lower punch and upper punch by spring pressure, and cycle continues until part is free

sity values are essential to achieve improved sintered strength and elongation, and if it is necessary to have the highest possible precision for three or more individual projections in the pressing direction, it may be preferable to choose the German tooling system.

The German tooling system is of sufficient importance to justify a detailed analysis:

Figs 10 *a* to 10*d* show the main principles of a powder compacting tool as it has been described in the literature. [6 7 8]

The main parts of this tool are:

The die 0, which is mounted in a "downwards-upwards" movable die-table 1, the stationary lower punch 12 and the adjustable lower punches 13, 14, the upper punch 5 and the stationary press table 10. The press table must be rigid to withstand the total pressure from the upper ram.

The die table 1 is connected to a yoke 9 by means of connecting rods 8. Thus, die movements necessary at certain stages of the press cycle are actuated by movement of the yoke. The connecting rods are guided in bushings in the stationary press table.

Yoke 9 is connected with the arrangement for producing the necessary movements of the die table 1 by a shaft 11 and an adjustable joint 30. Die movement may be produced by a cam 31 situated below the adjustable joint, by means of a separate hydraulic or mechanical arrangement, or it may be secured by a link and a traction rod actuated by a cam attached to the free end of the crank-

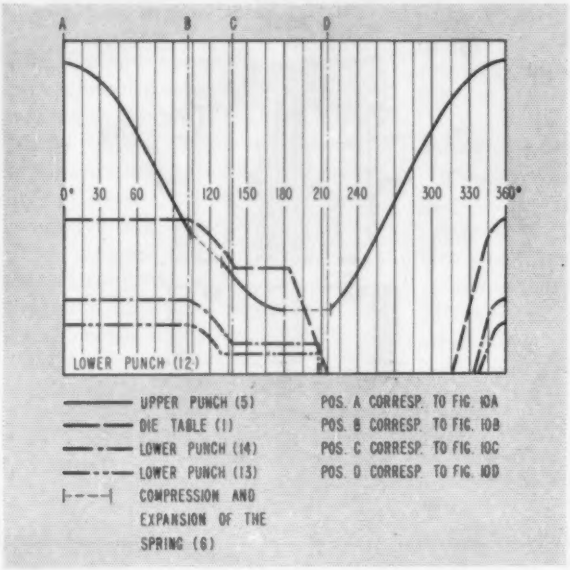


Fig 11 . . Time-distance functions of the die and upper punch are shown in relation to the press cycle

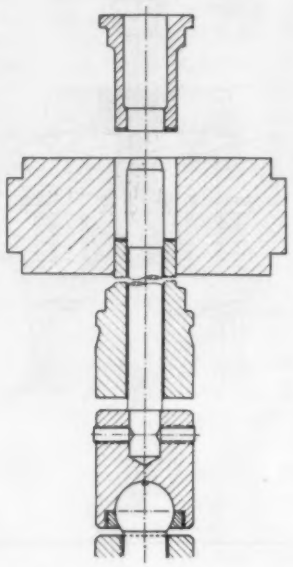


Fig 12 . . French ball-joint design for connecting the core rod with its ram improves alignment for conventional compacting

shaft. Springs 32 serve to keep roller 33 in contact with the cam. Consequently, the force of these springs must be sufficiently strong to carry the load of the die table and, when applicable, to accelerate upward movement of the yoke and die table.

The lower punch is divided into three auxiliary punches (12, 13 and 14). Two of these are individually adjustable for height. Three pins (15, 16, 17) are attached to the punches. On the lower ends of the pins 16 and 17 there are mounted double nuts, whereas a single nut is mounted on pin 15. The level of the upper end section of the punch 12 corresponds to the highest projection of the finished part. This punch with its pin 15 and the single nut are fastened to the stationary table 10, but pins 16 and 17 are guided in the press table. Two springs 19 tend to force the auxiliary punches 13 and 14 downwards. The double nuts 18, which in the fill position rest on the yoke 9, serve to adjust the punches 13 and 14 in the height direction.

Two spring-backed side cams 20 and 21 act upon punches 13 and 14. Two wedges 23 act upon rollers 24, which are mounted on the cams 20 and 21. The two outer punches 13, 14 are equipped with shoulders 25, 26, which are moved by the die 0. Washers between the yoke 9 and the connecting rods 8 are used

table 4— **SUITABLE CLEARANCES IN POWDER COMPACTING TOOLS**

Clearances between	Clearances expressed as Microns to 25 mm	In. per in.
Guiding pins and bushings in the movable die table	abt 52	0.00208
Connecting rods and stationary press table	abt 52	0.00208
Dies and punches, punches and cores	3-9	0.00012-0.00036

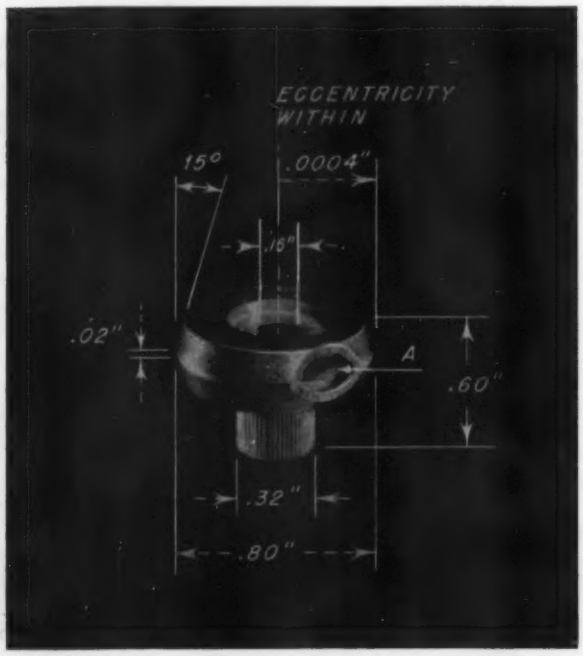


Fig 13 . . High precision part was made with core-rod alignment principle, in order to achieve required concentricity

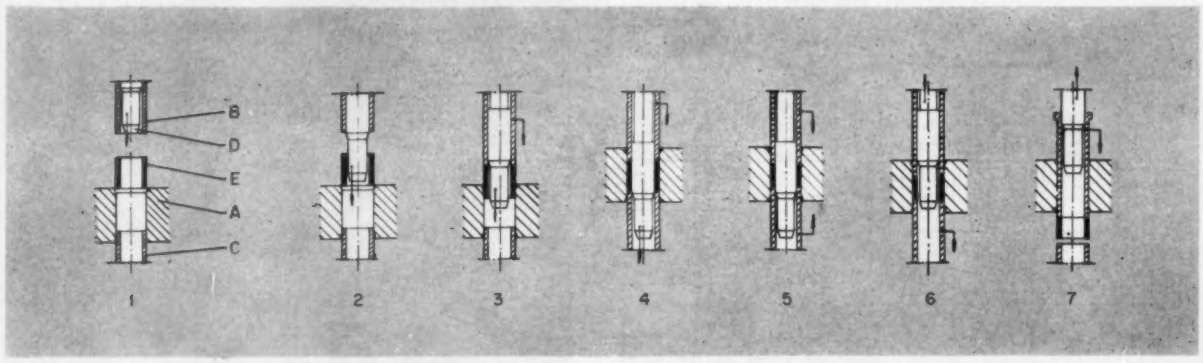


Fig 14 . . Automatic coining of bushings involves use of three punches: a piloting and sizing punch, and upper and lower coining punches. Seven positions are shown

for adjusting the distance between the die 1 and the yoke.

HOW THE DIE FUNCTIONS

In Fig. 10*a* the fill position is shown. The die 0 is at the up position, and the positions of the upper ends of the punches 13 and 14 are adjusted by nuts 18. Individual fill heights of the punches 12, 13 and 14 are adjusted to correspond to the proportions of the final heights of the three different projections of the part after compacting. In reality, these different fill heights cannot be adjusted to correspond exactly to the three different projections, because during the compression stroke some powder may be forced sideways from one projection to another. Therefore, the actual fill position requires application of practical experience. Conditions may vary considerably for different parts and powders.

When the pressing cycle starts, the upper punch 5 moves downward a short distance into the die; Fig. 10*b*. Next, the die starts moving downward with nearly the same velocity as the punch 5, until the position indicated in Fig. 10*c* is reached. During this simultaneous downward movement, increasing pressure causes punch 5 to overcome the force of the spring 6 and contact its attachment device, 4.

As soon as lower punches 13 and 14 are brought in contact with side cams 20 and 21 by the force of the springs 19, continued downward movement of these punches is hindered. At this moment the auxiliary punches are in press position, which corresponds to the final height projections of the finished part. The die table 1 and the punches 12, 13 and 14 now stand still. The upper punch 5 continues downwards to compact the part to the final density. The profile of the cam 31 during this period is concentric. If friction between the powder and the die-walls is sufficiently high to overcome the force of the spring 32, the yoke may continue downward a short distance during this period.

Upon completion of compacting, punch 5 starts moving upward. Initially ram velocity is slow and the upper punch 5 remains in contact with the compacted part because of pressure of spring 6. Simultaneously, the die 0 moves downwards to the position in Fig. 10*d* because of the curve of the cam 31. During this period the wedges 23 have forced the side cams outwards so that punches 13 and 14 are free to move down until they withdraw from the work and rest on the stationary table 10. When die 0 has reached its lowest position, the lower punches are flush with its top surface. Now the ejected part can be picked off 0 when the upper punch rises. Meanwhile, actuated by the springs 32, the yoke starts moving upwards, and the press comes to a standstill when the original fill position has again been reached.

The time-distance functions of the movements of the upper level of the die 0 and of the upper punch 5 are shown in Fig. 11.

At a first glance, a tool like the one described gives an impression of intricacy. Suppose, however, that the floating table, the yoke and the connecting rods are considered standard elements, and that the die is designed to be fitted into the floating table. In this case, only the die itself, the upper and lower punches with their adjustment devices and, if applicable, the side cams have to be changed when tooling up for a new part. If two or three such systems are available for each press, it is always possible to have a new tool ready for action.

Advantages of this tooling system are:

1. Rigid parts with more than three projections in the pressing direction can be compacted to high densities.

2. The dimensional accuracy of all projections, except the thinnest, can be held to very close limits.

3. The punches can be shorter and more rigid than is the case of American tooling.

In the usual press it is always necessary to allow for elastic movements of the long press rams that act on the separate punches. Thus, with the German tooling system, the precision is concentrated in the tool, whereas in the American system, the accuracy in the pressing directions is directly influenced by possible elastic movements in the entire press system. Further, in a tool of the German type, during the entire ejection or withdrawal period the various projections in the pressing direction are supported by their corresponding punches, until they have been brought out of the die. Consequently, the risk of breakage of fragile thin sections can largely be eliminated.

To achieve increased dimensional accuracy when compacting bush-

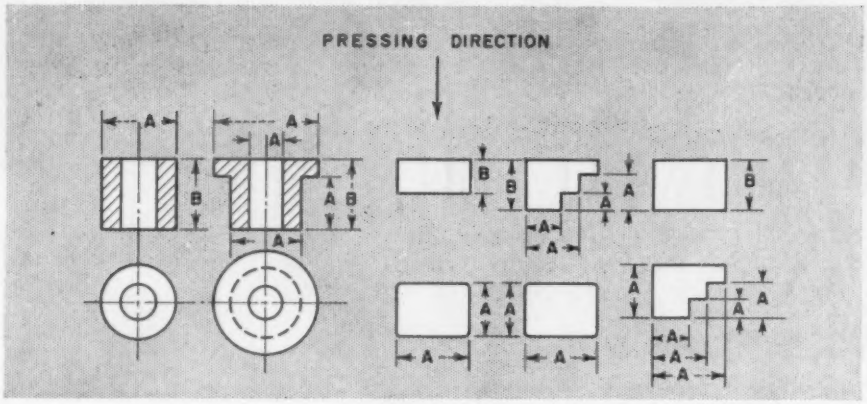


Fig 15 . . Dimensions *A* are affected by tool design alone, while dimensions *B* are influenced by both the tool and press

ings in American presses, a French firm has developed a special ball-type joint (Fig. 12) between the core rod and the core rod ram. This connection compensates for possible misalignment in the press. An intricate and accurate part produced in this manner is shown in Fig. 13. After sintering the piece is coined in an especially careful manner. Features of the part are:

1. Although the land is only 0.02 in. high and the angles of the conical parts are 15°, no burrs can be discovered when the part has been ejected from the die.

2. The punches produced large quantities of parts before replacement, although the compacting pressure is high, corresponding to a sintered density of about 6.7.

3. The eccentricity is held within 0.0004 in.

4. The part is chromized by the Onera process[5] before final sizing. At *A*, Fig. 13, the quality of the chromizing is demonstrated. The part has been exposed to nitric acid, after a small part of it has been cut away. Note how the acid has attacked the interior without affecting the chromized surface coating. The chromized coating is ductile, but can be carburized and hardened to extremely high hardness values. This property is being used, among others, for production of grinding cones for French pepper mills.

table 5—**TOLERANCE ATTAINABLE ON SINTERED PARTS (See Fig 15)**

Dimensions A *depend on tool characteristics*
Dimensions B *depend on tool and press characteristics*

Final Operation	Dimensions	Limits Achieved, In. per in.		
		High	Medium	Coarse
Coining and precipitation hardening	A	0.00052	0.00208	—
	B	—	0.00132	0.0052
Sintering	A	—	0.00208	0.0084
	B	—	0.00326	0.0208
Case hardening	A	—	0.00208	0.0208
	B	—	0.0052	0.0208

TOOL CLEARANCES

Alignment of the upper punch is critical in powder metallurgy. Normally, alignment is obtained by four guide posts attached to the ram, and entering bushings in the movable die table before the upper punch enters the die.

Under these conditions it is desirable to do all related boring operations simultaneously on a jig borer; for example, the bores in the stationary press table and the corresponding bores in the movable die table. Some important clearances are listed in Table 4.

There are no special problems involved in the choice of suitable materials or in dimensioning the various elements in the described tool.

The compacting tool, i.e. the die and the punches, deserve a few words. If low-density parts are concerned, and if the production volume is 50,000 to 150,000 parts, a so-called "non-warping" steel is recommended for the die. This should be heat treated to the highest possible hardness.

If high-density parts involving high compacting pressures are concerned, or if production volumes are very large, carbide or nitrided high-speed steel are preferable die materials. In this case, the die normally is split and hot shrunk into a steel ring after heat treatment, grinding and polishing.

For cores use the same material, surface finish and hardness as for the dies.

In Europe, punches are not made to the upper limit of hardness. If they have sharp edges or thin lands, a hardness of 45-50 R_c is considered suitable. Often "non-warping" tools steel is chosen for punches used for low-density compacts, but other suitable steels may be chosen.

It is evident that the stationary pressing table must be protected against excessive punch pressure. Therefore, normally a hardened steel plate is arranged below the side cams, to distribute the pressure of the lower punches.

COINING OF POWDER-METAL PARTS

The demand for the highest possible dimensional precision calls for special attention to the coining techinque. One example will demonstrate how a French firm has solved the problem of coining bush-

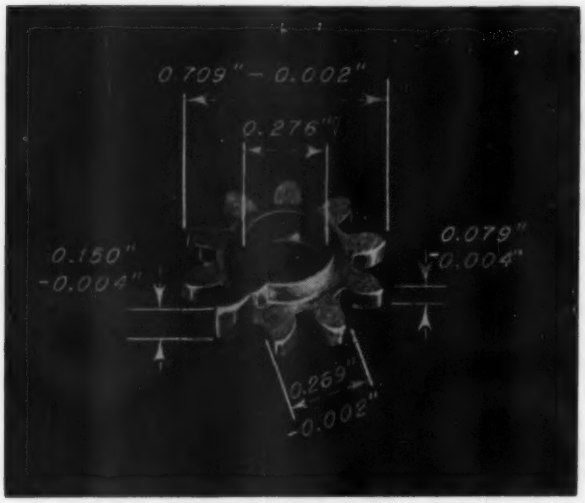


Fig 16 . . Gear for calculating machine is double pressed and sintered, then cyanided and hardened. Density 7.2-7.4 g/cm³

ings to high dimensional accuracy. A special cam-operated coining press, which works fully automatically, was developed by LaMetallurgie des Poudres. The various steps involved in the coining operation can be seen from Fig. 14, and warrant the following comments:

1 . . A special loader places bushing *E* just above the mouth of die *A*.

2 . . Piloted sizing punch *D* enters the bushing. The pilot end is 0.004 to 0.04 in. smaller than the upper part. The pilot serves to correct eccentricity of the bushing arising from warping during sintering or other reasons, plus centering it in the die.

3 . . The bushing is forced into the die by punch *B*, at a velocity about equal to that of the sizing punch, so that the bushing surrounds the thinnest part of the pilot during entrance in the die.

4 . . When the die has been closed by the upper punch, the inner punch continues its movement, so that its thick upper part traverses the bushing bore.

5 . . When the bushing has thus been sized, the lower punch *C* and the upper punch move towards each other until the bushing has been squeezed to the exact height.

6 . . The lower punch moves downward and the sizing punch upwards.

7 . . The bushing is then ejected through the die by the upper coining punch.

By dividing plastic deformation of the bushing into several steps, it is possible to reduce the required total pressure for coining. Thus, a 5-ton automatic press is capable of sizing a bushing normally made on a 15-ton conventional press.

TOLERANCES OF SINTERED PARTS

Fig 15 and Table 5 indicate the tolerances that are considered normal for sintered parts in Europe.[1] It is obvious that the highest tolerance classes are applicable only if the last step involves a coining operation.

If the last step on a part involves heat treatment, for example casehardening, the maximum dimensional accuracy obtainable must be estimated by empirical methods. Fig 16 shows a gear for a calculating machine. This wheel has a density of 7.2 to 7.4. In spite of being casehardened, the part has good dimensional accuracy. The high density, involving high compacting pressures, necessitates the use of hardened and nitrided high-speed steel for the die and the core rod. Thus, the die was assembled from 10 sections—one for each tooth. To guarantee tolerances, it was necessary here to maintain extremely close tolerances after coining, because cyaniding and hardening caused considerable dimensional change. Therefore, the over-all dimensional accuracy of the assembled die, punches, and core had to be held to 0.00016 in.

SINTERING OF IRON PARTS

Before sintering, several European plants evaporate the lubricants at 600 to 650 F under conditions of full air admission in continuous or batch-type furnaces. There are several reasons for this operation. First, sintering furnaces with molybdenum resistors are more common in Europe than in the USA. These expensive resistors are sensitive to attack by lubricant fumes. Second, rather small sintering furnaces are used, where a special pre-heating zone for evaporating the lubricant cannot easily be arranged. Third, oxidation of the parts, which occurs simultaneously with evaporation of the lubricant, increases the elongation considerably, and, to some extent, the tensile strength of the finished product.

Oxidation of parts before sintering may seem contradictory to what has been said before about the common demand for low oxygen content in powders. However, the oxidation occurs only in a very thin surface layer, which is then readily reduced during the sintering cycle.

EQUIPMENT FOR SINTERING

Standard types of converted copper-brazing, conveyor-belt furnaces and other types are common in Europe. Batch furnaces are also used in some plants.

The demand for high mechanical properties has required development of furnaces capable of higher temperatures than can be obtained with nickel-chromium resistors. Furnaces with molybdenum resistors, which were originally developed in collaboration between Metallwerk Plansee, Aus-

tria, and Degussa, Germany, have proved suitable and reliable for high-temperature sintering. Some precaution must be taken to protect the molybdenum resistors against attack, especially from gases containing carbon, and from dust emanating from metal powder or ceramic furnace linings. Both pusher and "walking beam," molybdenum-resistor sintering furnaces have been developed in Europe.

Sintering temperatures up to 2425 F are not unusual for iron. The choice of temperature depends on local conditions and on the type of raw material. It seems, for example, that Husqvarna Vapenfabriks AB in Sweden, using electrolytic - iron powder, operate mainly at about 2200 F, whereas at Metallwerk Plansee in Austria sintering temperatures as high as 2425 F can be considered standard. Apparently the quality of the parts manufactured at Husqvarna and at Metallwerk Plansee can be considered about equal. The temperatures depend on the different characteristics for electrolytic iron powder and for powders that are mainly mixtures of DPG, RZ sponge and Hametag iron, as used in the two respective plants.

SINTERING ATMOSPHERES

In Europe, dry hydrogen or cracked ammonia are used for sintering atmospheres, although some plants utilize partially burned city gas. When processing alnico magnets, vacuum sintering is common.

One plant has succeeded in sintering high-class ferrous materials without much attention to the sintering atmosphere. An oil-heated furnace with a semi-tight ceramic muffle, surrounded by the burning oil gases, was used. The oil furnace was operating with as reducing an atmosphere as was possible to achieve without incomplete combustion occurring, and some oil was dropped direct into the sintering chamber for securing improved reducing conditions. Covered boxes were used to transport the parts through the furnace. Good results were obtained by this simple method.

There has been some talk about "activated sintering" in Europe during recent years. At least one European firm claims that activated sintering is regularly being used for production of sintered iron. There were no high-temperature sintering furnaces in this plant. Consequently, it was necessary to try other means to satisfy market demand for high-quality sintered products. Two examples of the results obtained with this sintering technique are demonstrated by Fig 17. The upper part is a magnetic pole piece—intended for an electric measuring instrument, and the lower one is a part for a French small arm. Seen against the background of the comparatively low density values for these parts—sintered density about 6.5 g/cm^3 — the excellent ductility, demonstrated by the bent pieces, must be considered as striking. MH-100 grade of powder was used for the manufacture of these parts.

Sintering was carried out at 2050 F in a laboratory furnace with an atmosphere of cracked ammonia. No special attention was paid to purification of the atmosphere. Air ingress to the chamber was prevented only by a door and the usual flame curtain. Test parts were placed in covered iron boxes. About ½ gram of a volatile halogen salt was placed in a small container in a corner of the box, when activating conditions were desired.

Fig 17 .. Excellent ductility despite low density values has been secured by activation during the sintering process

The influence of activation on sintered strength is clearly demonstrated by Table 6. Tests indicated that the silicon had become alloyed with the iron, and that a rather homogeneous alloy had been formed.

table 6 .. **EFFECT OF ACTIVATION UPON SINTERED STRENGTH**

Sintering Conditions	Sintered Density g/cm^3	Tensile strength; psi		
		1% Si	2% Si	3% Si
Non Activated	5.50	14,000	14,300	13,500
	6.20	21,500	21,200	19,800
Activated	5.50	16,300	21,300	23,400
	6.20	27,800	30,400	34,000

Ancor 80 iron powder with 1%, 2%, or 3% silicon powder—150 mesh. Sintered in covered but not sealed boxes in H_2 atmosphere at 2,100 F for one hour

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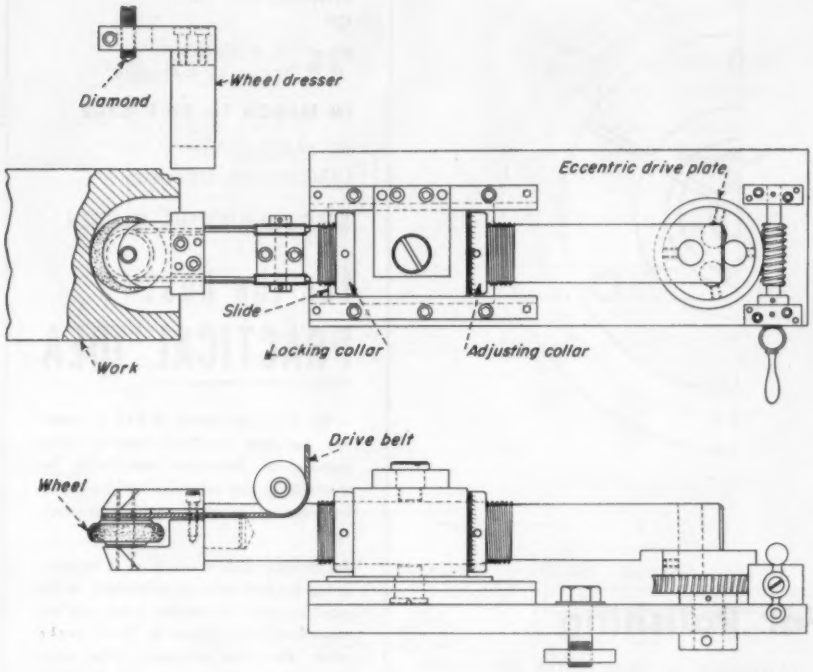
Practical Ideas . . .



Toolpost Grinding Attachment Finishes Spherical Sockets

The device shown here was made for finish-grinding of spherical sockets after hardening. Although the attachment is rather slow, we are pleased with the results we get in this difficult kind of work.

The device is essentially a pivoted bar, one end of which holds the grinding wheel, and the other end of which is turned with an eccentric motion, the amount of which can be adjusted by putting the eccentric wheel into one of several different holes.

The unit is built up on a base plate which is clamped to the lathe compound. The plate carries a pair of capped rails which confine and guide a slide. A rectangular block pivots on this plate and on an upper and lower pin.

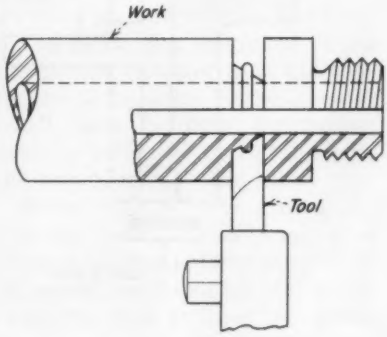
The pivoting block carries the grinding bar, one end of which holds the grinding wheel. The other end of the grinding bar is fitted with the eccentric-drive plate which has a number of holes at varying distances from the center. A worm drive turns the drive plate.

The grinding head consists of a base block and cover, and the grinding wheel runs in porous bronze bearings. The lower wheel flange is made integral with the shaft, while the upper flange is threaded onto the shaft, and grooved to take a round drive pulley. A ¼-hp motor mounted overhead on a hinged, spring-loaded plate furnishes power to the grinding wheel.

The grinding attachment was used in a large engine lathe, with shims between the grinder base and compound to bring the grinding wheel to the centerline of the lathe spindle. Size of the circle described by the wheel is adjusted by threaded collars. To feed the wheel to a larger diameter, the collars are adjusted to move the center slide to the right.

Depth of the socket is controlled by moving the lathe compound to left or right.

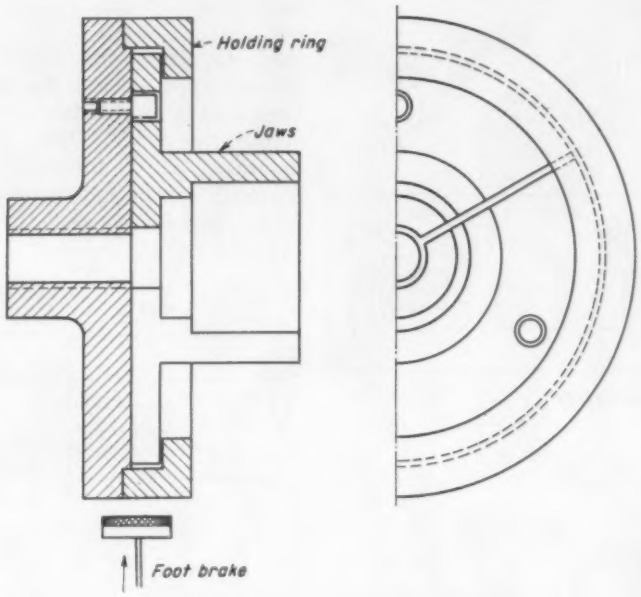
A special diamond dresser is used to dress the wheel. The dresser slips around the grinding head, and is rotated back and forth across the wheel. The diamond mounting bar is threaded, so the diamond can be fed in toward the wheel. *Robert Weidenhoft, Brooklyn, NY*



Groove in Cutoff Tool Prevents Skewing

When cutting off hollow stock with an angular tool, to prevent a burr on the piece being cut off, the tool often has a tendency to bend and pull through the work, leaving a ragged edge protruding halfway around the work. This bending can be prevented by grinding a groove in the front surface of the tool. This groove produces a notch in the surface of the work, which steadies the tool and keeps it in alignment.

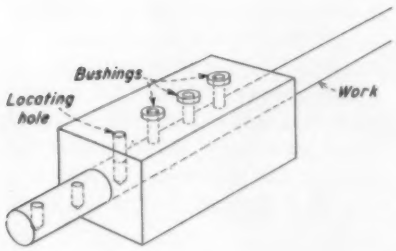
The groove in the tool can be cut with a thin cutoff-type grinding wheel, care being taken to give the sides of the notch the proper relief. *H J Gerber, Stillwater, Okla*



Centrifugal Chuck For Polishing

This chuck is very quick and effective for holding various kinds of work for polishing, buffing, and cleaning operations. The chuck has interchangeable jaws for different sizes of work, and requires a minimum of special installation when being put into use.

The jaws work on a centrifugal principle, so that, after the work is put in place and the chuck starts to revolve, the jaws grip the work tightly, but soon as the chuck stops, the jaws are free, and the work can be removed. The chuck we have was made from aluminum castings, and was inexpensively built. *M E Hofstetter, Camden, NJ*



Simple Jig Aids Drilling Multiple Holes In Round Work

The sketch shows a simple drill jig for drilling rows of holes equally spaced in round stock. The device is quite easy to make, being a piece of rectangular steel bored to rod size plus clearance, with one locating hole and three bushing holes in the top of the jig.

After the first hole is drilled, the drift pin is put in place in the locating hole, and the jig is held firmly in place while the next three holes are drilled. Then the pin is removed, the jig is moved along the work until the drift pin lines up with the last drilled hole, and the process is repeated. If extra long rods are to be drilled, the square block can be made longer than needed, and a section of the block can be cut off and used to support the far end of the work. *Joseph Saproni, Trenton, NJ*

Ordinary window screening is excellent for removing paint, dirt, and rust from metallic surfaces, requiring a minimum of rubbing, and without damaging the surface.

The screening, being fairly stiff, can be folded, to reach otherwise inaccessible places. *Lester J Peck, Manitowoc, Wis*

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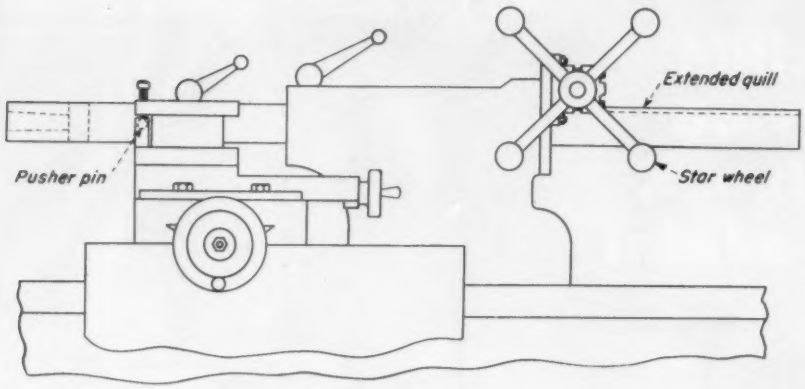
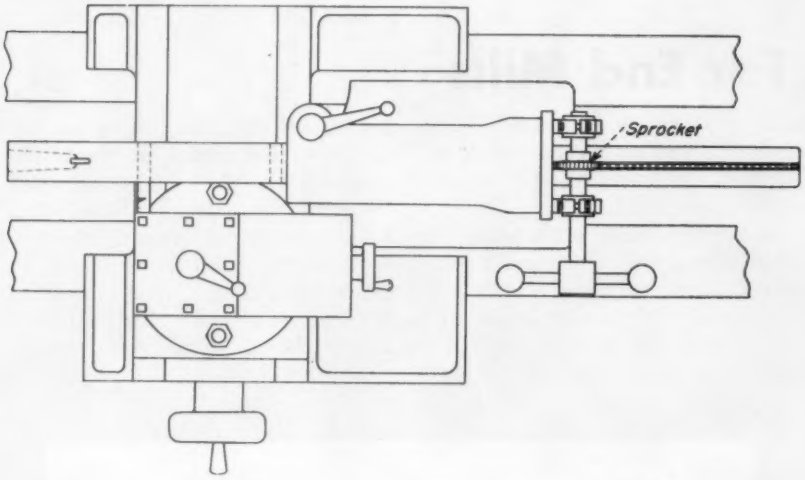




Power Feed To Tailstock Quill Speeds Repetitive Drilling

Repetitive work on an engine lathe often requires such operations as drilling from the tailstock, which can be tedious and time-consuming. Shown here is a device we have added to our engine lathes, to speed such drilling operations. With the device we have power-feeding, rather than turning the crank of the tailstock by hand.

To make the attachment, a piece of mild steel of the same diameter as the tailstock quill, but considerably longer, is taper-bored and a drift-hole is bored in one end, to duplicate the original quill. A keyway is milled in the same position as the original, but longer, to allow more travel. At the other end a slot is milled for half the length, wide enough to take a piece of ⅜- or ½-in. roller chain. One end of the chain is secured to a dowel in the center of the quill, and the other end is slipped over a threaded hook, to allow light tension to be kept on the chain.

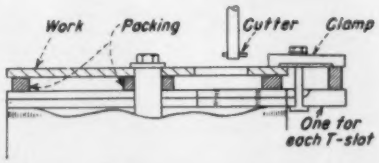
Holes for the pusher pin are drilled at intervals along the shaft, with the diameter of the holes equal to ¼ the diameter of the shaft. The plate which carries the sprocket assembly has a hollow pilot on one face, to fit the recess left by the handwheel. The plate is also bored to quill OD.

When making the first assembly of the device, the plate is placed in position, and the quill is pushed through the tailstock until it engages its key. Then the sprocket assembly is meshed with the chain, thus locating the correct position for the bolt-holes for the sprocket support.

The pusher pin is a piece of rectangular stock which fits the toolpost. One end is turned to a diameter 1/16 in. smaller than the holes in the quill. The centerline of the pin should coincide with the centerline of the holes, so the operator won't have to hunt for proper packing pieces each time he puts the attachment on the lathe.

When work is to be drilled, the operator locks the tailstock in a suitable position, places the drill in its socket, and turns the star wheel until the drill touches the work. He then moves the saddle and cross-slide until the pusher pin can be engaged in one of the holes in the quill. Engaging the power feed of the saddle drives the drill, while the operator is free for other work.

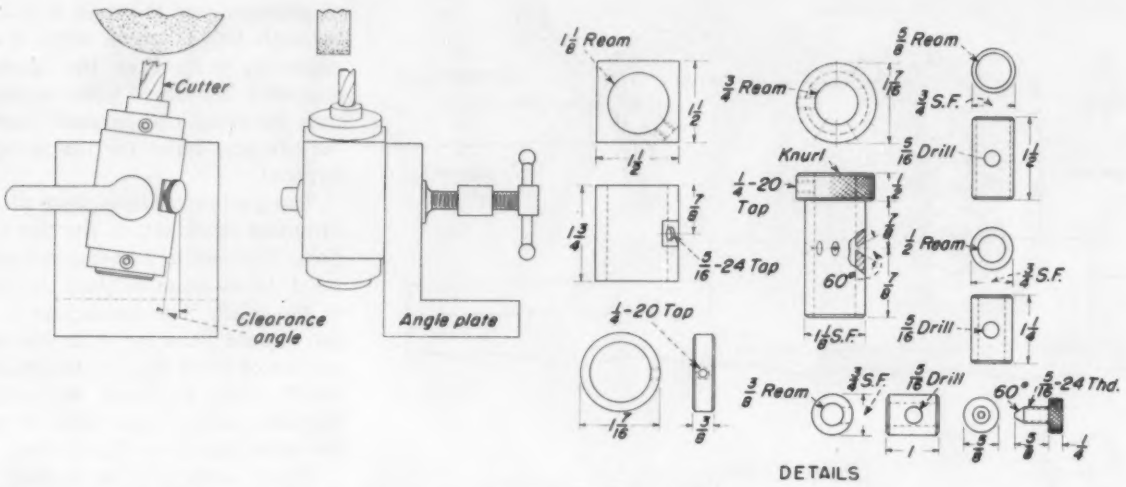
As one of our lathes does more chuck work than center-work we find that during about 75% of its working time it is equipped with the drilling device instead of the standard tailstock center. *Doug Moore, Victoria, Australia*



External Packing Holds Work

Recently we had to bore six equally spaced holes in some fairly large circular plates. The work was the same diameter as our circular table, leaving no room for bolts or packing, and the milling machine table did not have enough traverse to do the job with the coordinate method.

We got around this trouble by making extension pieces as shown. They fit in the T-slots of the table, and are locked by tightening the clamp screws. *T A Fitzgerald, Middlesex, England*

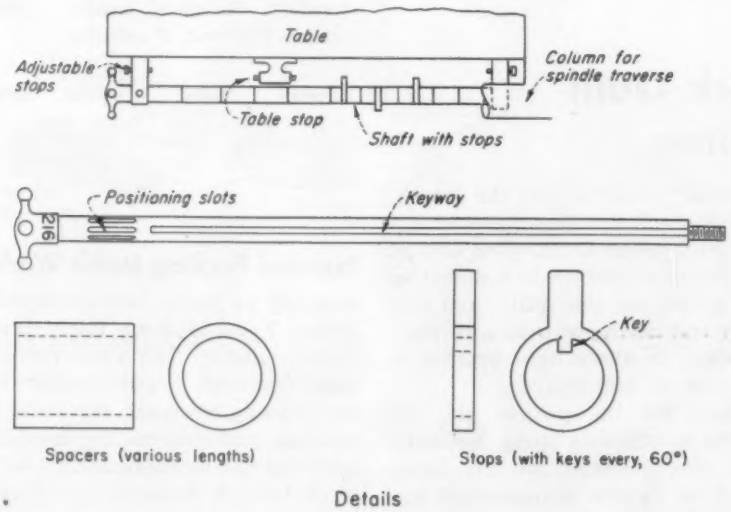


Sharpening Jig For End Mills

End mills with dulled or chipped cutting edges near the cutter end can usually be sharpened by merely grinding the ends, rather than resharpening the entire flute length. To do this, we have made a sharpening jig which does the job quickly and accurately.

Twelve indexing positions accommodate 2- 3- and 4-flute end mills with shank sizes from 3/8 to 3/4 in. Larger tools could easily be handled by changing the dimensions of the jig.

In use, an angle plate is set up on the magnetic chuck of a surface grinder. The jig is tilted to the desired clearance angle and clamped to the face of the angle plate. The grinding wheel is then positioned over the work so the corner of the wheel intersects the center of the work. It is then easy to grind all edges to the same height by merely indexing for each tooth space. If it is necessary to relieve the center, this can easily be done with a suitably dressed saucer wheel. *Stanley G Hagen, Richmond, Calif*



Spacers And Stops Aid Profiling

When machining castings on a P&W profiler, we found that, with more than two stops on the table, many operations can be combined. We have used inserted stop-blocks, but this was time-consuming and was not practical for operations that required more than three stop positions.

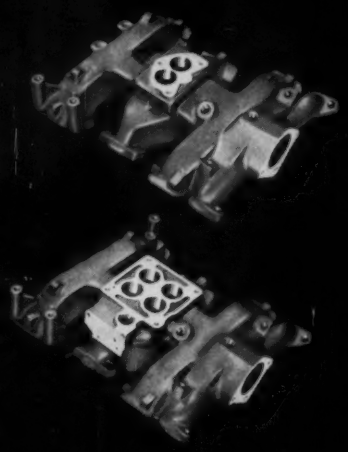
With six stops on the table (2 on spindle traverse, and stop-blocks for spindle height), 2 or 3 setups and handling of the casting have been eliminated. We have also used these stops for clearance of the work and clamps on the fixture, speeding the operation and reducing scrap and maintenance of equipment.

The attachment is universal, using spacers for dimensions in the same manner as a horizontal mill arbor. Stops are indexed by turning the hand-knob, and are retained in position by a spring-loaded ball. The front adjustable stop on the bed can be moved the length of the slots on the shafts, to secure spacers and stops when setup is complete. *George E Koskey, Deerfield, Ill*

Another Transfer-matic by Cross

Mills, Drills, Bores, Taps, 2 and 4 Barrel Intake Manifolds

- ★ Rough and finish mills carburetor pad; mills choke pad (4 barrel only); bores carburetor port holes; drills and chamfers all holes (except 3 holes in water outlet pad); and taps all holes.
- ★ 140 pieces per hour at 100% efficiency.
- ★ Initial part location from port openings.
- ★ Push-button changeover from 2 to 4 barrel carburetor.
- ★ 13 stations; 1 loading, 11 working, 1 unloading.
- ★ Lift-and-carry type transfer mechanism.
- ★ Pre-set tooling throughout.
- ★ Other features: construction to J.I.C. standards; complete interchangeability of all standard and special parts for easy maintenance; hardened and ground ways; drag chain type chip conveyor.



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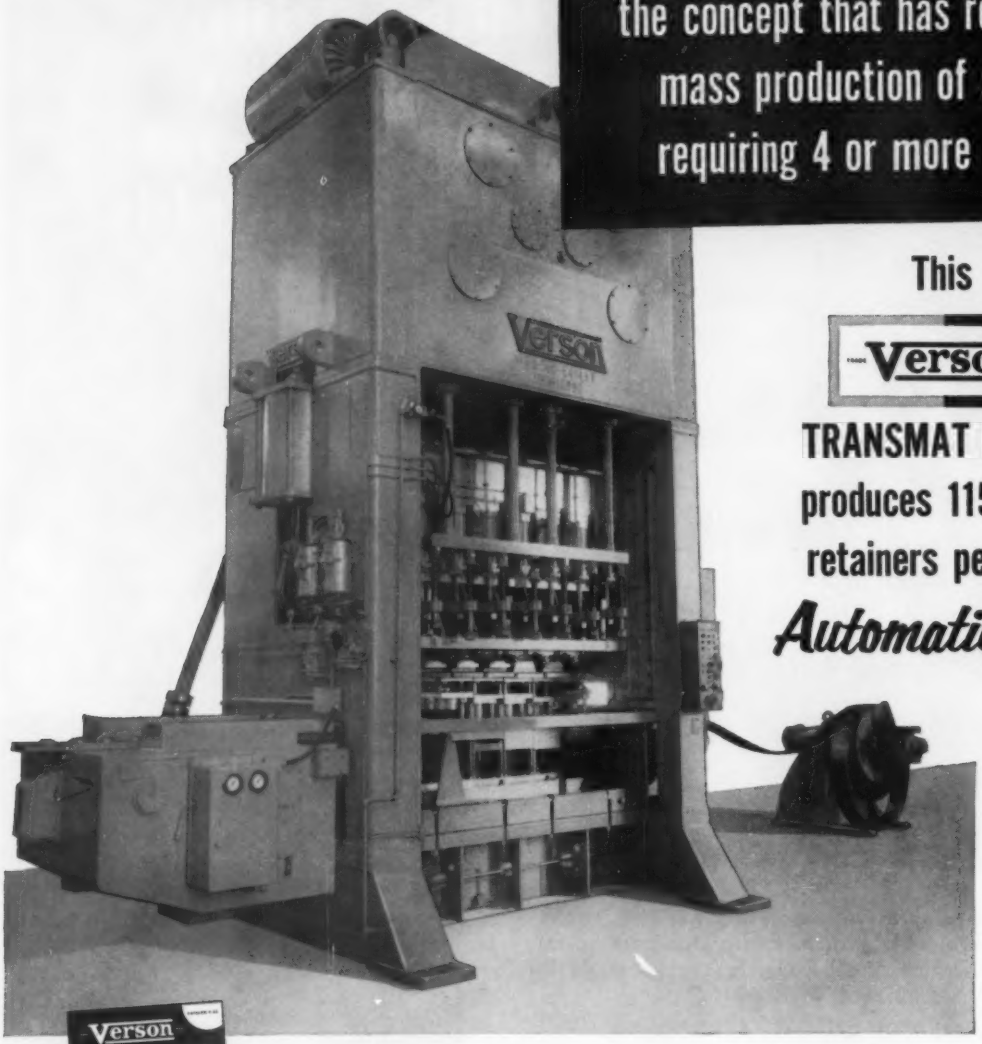
Special MACHINE TOOLS

Verson

TRANSMAT FORMING–

the concept that has revolutionized mass production of stampings requiring 4 or more operations



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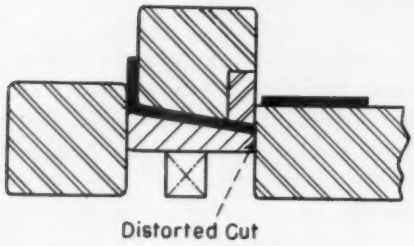
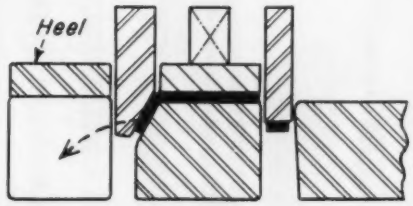
PRESS TOOLS FOR BENDING...IV

DON R KING, tool engineering consultant

OBTUSE-ANGLE BENDS — Continued



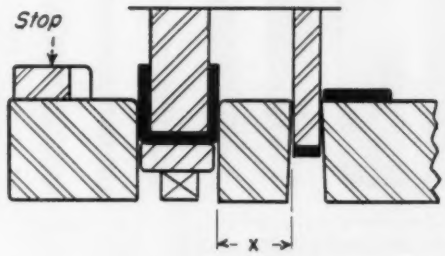
No. 18
Good design only when angle is close to 90°
Bends of good quality produced regardless of leg length or radius

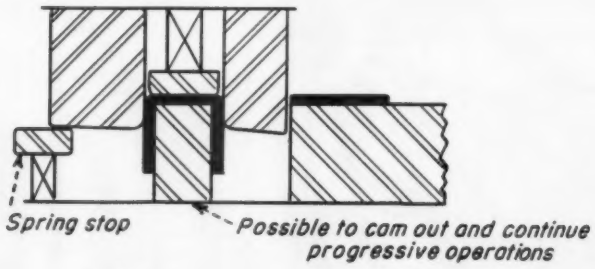


No. 19
Good-quality bends when legs are short
Push-through ejection is possible
Scrap slug is wasted
Large spring space needed in punch holder

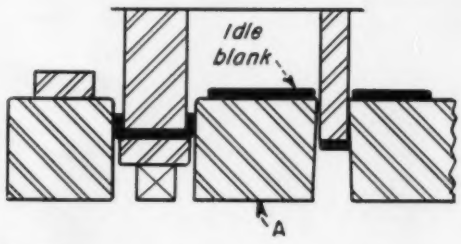
CHANNELS

No. 20
Good location and alignment of bends
Inclined ejection is desirable
Scrap slug is wasted
Long cutoff punch is required

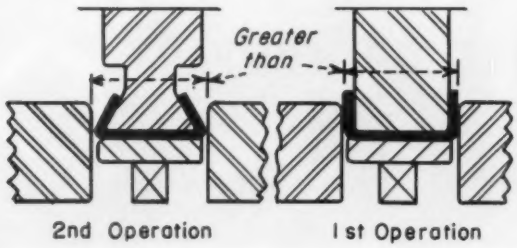




No. 21
Good design for cross-transfer operation
Inclined ejection is desirable
Large spring space needed in punch holder



No. 22
Same notes as for No. 20 above
Introducing an idle station avoids thin die wall



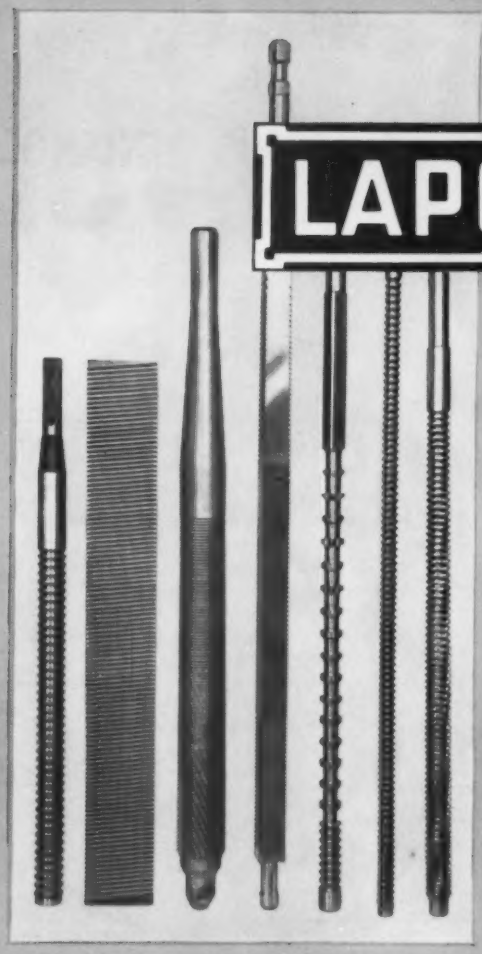
ACUTE CHANNELS

No. 23
Good quality bends are produced
Special ejection requirements must be met, but inversion may help
Cross-transfer or cut-and-carry progressive operation may be employed
Closely fitted guides or nest are required on 2nd operation

"A broach is a broach is a broach"
...or is it?

Even Gertrude Stein would never have said that, *if she had taken time to investigate the making of*

LAPOINTE BROACHES



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BROACHES for **involute gears** . . . in the automotive field

BROACHES for **jet engine "pine-tree" forms** . . . in the aircraft field

STEEL for all **LAPOINTE BROACHES** is produced under ideal conditions of quality control. Here's what we mean by that:

1. Steel for our broaches is poured to our own proven analysis.
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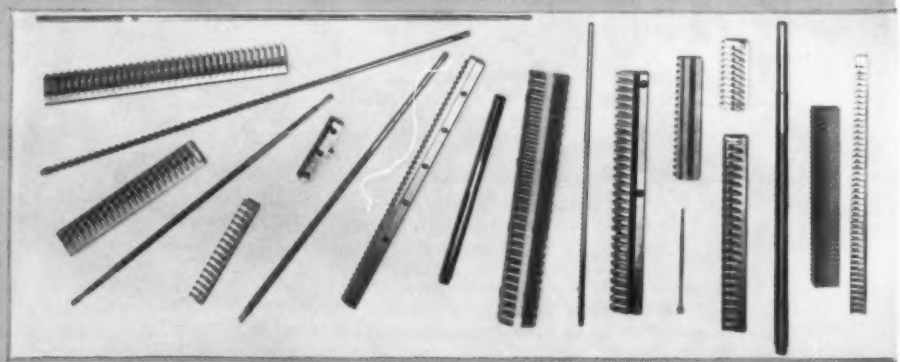

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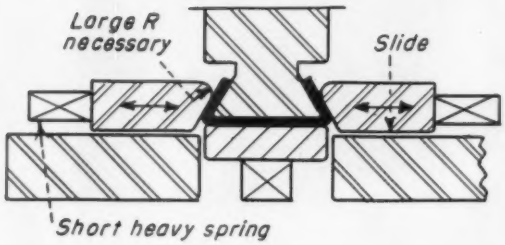
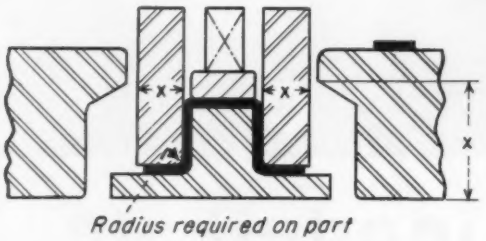
PRESS TOOLS FOR BENDING...V



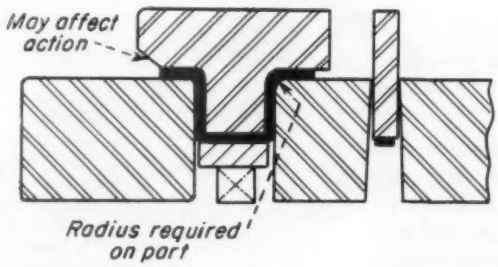
ACUTE CHANNELS — continued

No. 24
Good quality bends produced; even 90° bends in springy material
Not used for heavy stock or extreme acute angles
Special ejection means are required

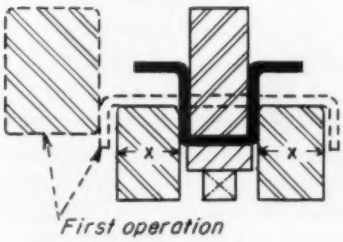
WINGED CHANNELS



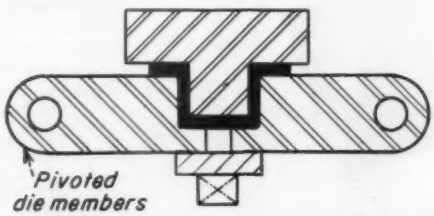
No. 25
Limited to small parts
Fair-quality bends produced, but wings will not be square unless spanked
Large spring space may be required in punch holder



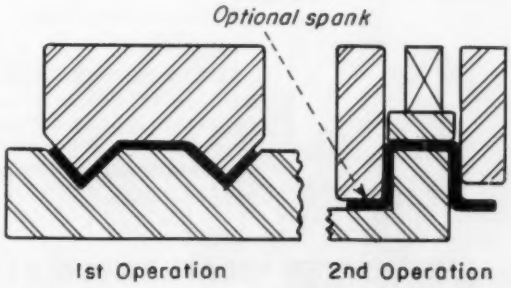
No. 26
Bends usually of poor quality, but die cost is low
Distortion remains from "slip forming" unless straightened by spanking
Not suited to parts of all proportions



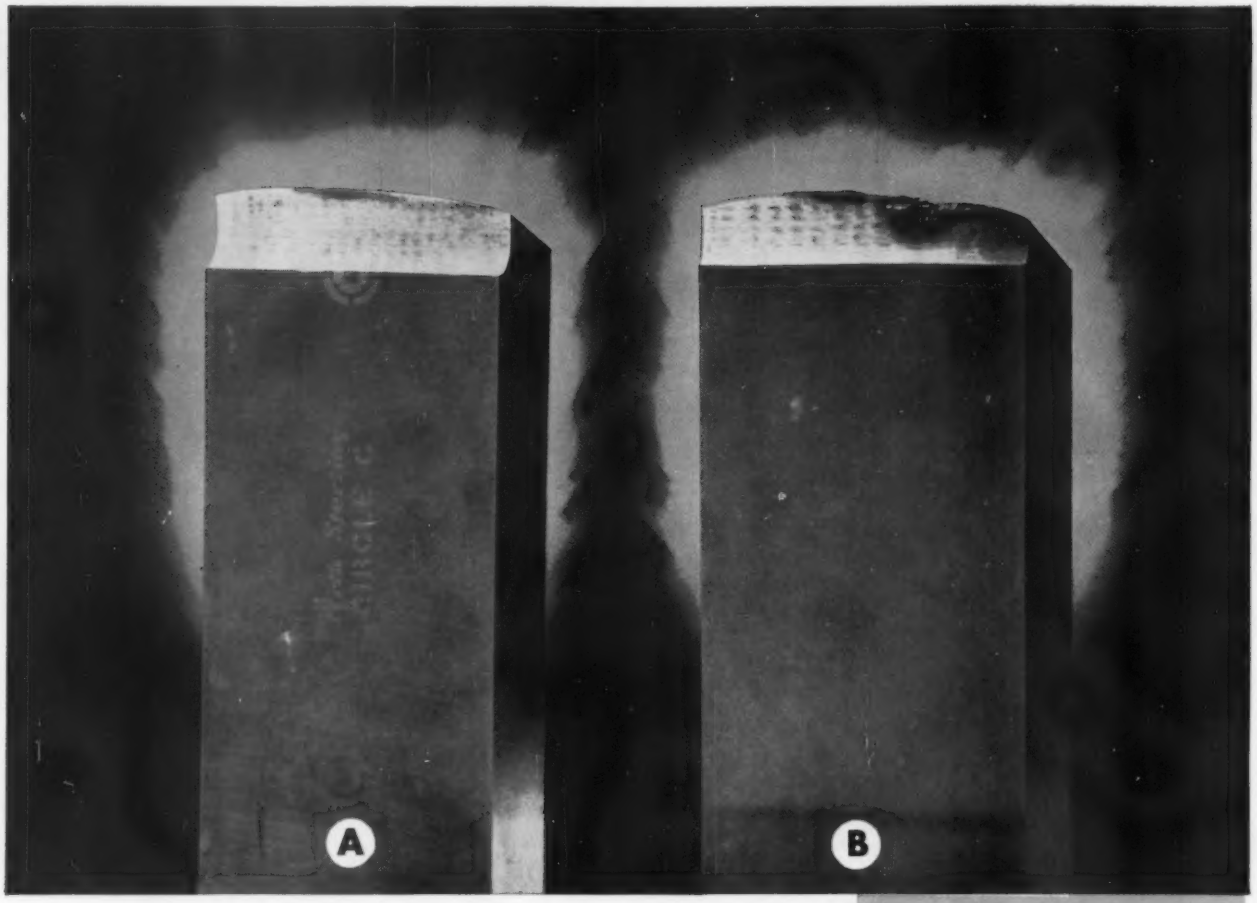
No. 27
Bends of best quality produced
Two operations are required; these may be cross-transfer or cut-and-carry progressive



No. 28
Bends of fair quality
Do not use for heavy stock
Die more difficult to construct, but useful for odd angles



No. 29
Fair quality bends
Useful for odd wing angles
Inversion of design is possible
Die may be cross-transfer or cut-and-carry progressive type



which tool cut leaded steel?

• Right! The answer could only be Tool A which was used on leaded Aristoloy—4140. Tool B was used on non-leaded Aristoloy 4140 under the same conditions.

A comparison of the cutting edges of both tools demonstrates how the freer machining characteristics of leaded steels increase tool life and thereby reduce machining costs. The lead addition acts as a lubricant reducing friction between chip and tool. Tools therefore operate at lower temperature, contribute to better chip formation and eliminate damaging tool edge build-up.

Why not find out what advantages leaded steel can offer you? Call your nearest Copperweld office today for complete information or write us direct.

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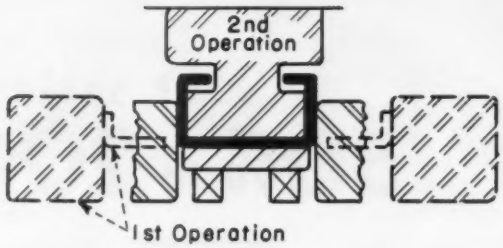
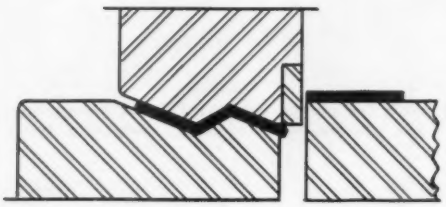
PRESS TOOLS FOR BENDING...VI



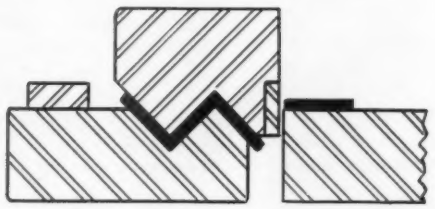
RETURN FLANGES

No. 30
Two operations are required, but method produces good-quality bends
Special ejection means required, but inversion may aid ejection
Piece may be cross transferred or made in cut-and-carry progressive die

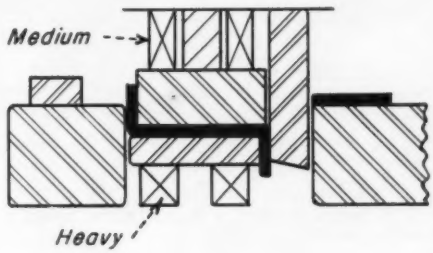
Z-BENDS AND OFFSETS



No. 31
Good quality bends on small offset
Low die cost

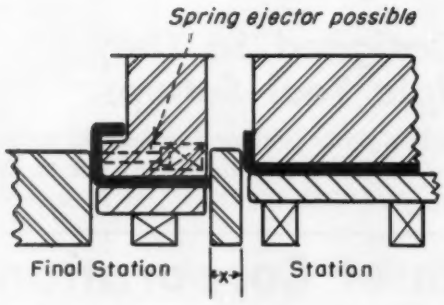


No. 32
Fair quality bends
Slippage of stock will cause some variation in bend location
Die is low in cost

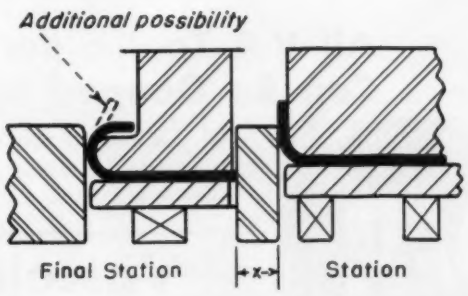


No. 33
Good quality bends produced
Slight tendency to creep is minimized by balancing spring pressures
Large spring space required
Pads must be guided

END HOOKS



No. 34
Good quality bends
Special ejection requirements
Inverted piercing and notching required



No. 35
Notes same as at left, except that slight distortion of bend radius may occur

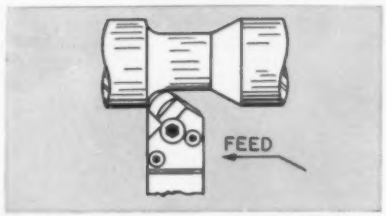
YOU CAN DO 90% OF YOUR MACHINING OPERATIONS

with nine styles of V-R TOOLHOLDERS

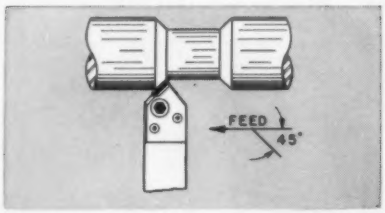
plus

"THROW-AWAY" BLANKS

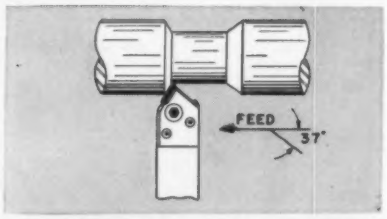
. . . at savings of 50% to 200%



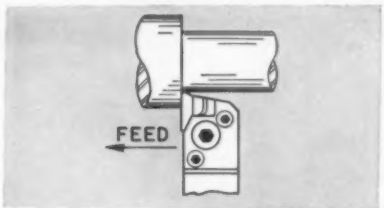
New RBR For turning, facing or plunge cutting. On large diameters the RBR makes an excellent boring tool.



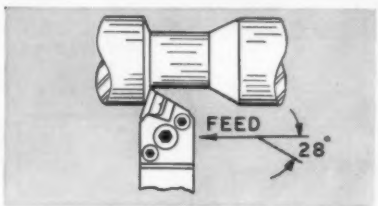
NEW TER With 45° lead angle for plunge turning, straight turning and chamfering.



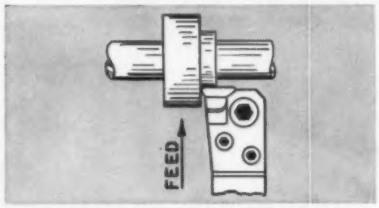
NEW TDR For plunge turning, straight turning, chamfering, and facing at 30°.



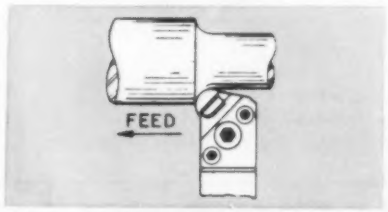
TAR For turning to a square shoulder with triangular inserts.



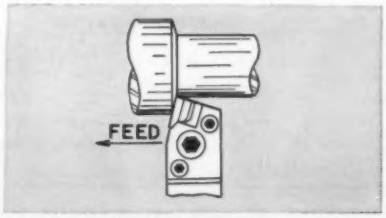
TBR For plunge turning with triangular inserts.



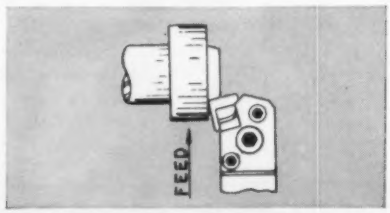
TFR For straight facing with triangular insert.



RAR For straight turning, facing and chamfering with a round insert.



SBR For straight turning, plunge feed turning, vertical turning, facing and chamfering.



SFR With 15° lead angle for vertical turning, facing and chamfering with square insert.

All V-R Toolholders Are Designed So They Can Be Ganged for Multiple Tool Set-ups.

All V-R Toolholders are available in right or left hand styles. All styles are available for either "Throw-Away" inserts or standard 1½" inserts. Write for the New V-R Toolholder Catalog VR-435B with New Low Prices.

Vascoloy-Ramet Corporation

312 MARKET STREET, WAUKEGAN, ILL.

Makers of the World's Finest Carbide

Talking Shop . . .

Cold Rubber

SOME TIRE and battery makers have found that auto tires and batteries keep better under refrigeration, so are using public refrigerated warehouses for storage. The same thing goes for golf balls, according to a San Francisco warehouseman. This should start a rush on home refrigerators, with a bowl of golf balls beside the bowl of melon or meat balls.

Back of Beyond

YOU WILL RECALL we said last Dec 20, in the foldout insert relating civilization to tools, that our civilization knows more about earlier ones than men in any of those did about the civilizations which preceded them. Now the University of Wisconsin Press, Madison 6, Wis, comes up with a translation of Thomas of Bradwardine's "Tractatus de Proportionibus," one of the most widely influential Medieval texts on dynamics and kinematics. Here for the first time were combined philosophical and mathematical traditions of mechanics. Here also was explained a new mathematical way of relating the variable involved in movement. The translator is H Lamar Crosby jr, and the book is yours for $3.50. Here you can seek out the beginnings of our own technical civilization.

Nickel Alloy Forged

HASTELLOY X, a nickel-base, high-temperature alloy, has been forged successfully into turbine buckets and 20-in. turbine rings by McWilliams Forge Co, Rahway, N J. To produce rings, 6-in. billets were heated in 5 hr to 2180 F by (low-sulfur) oil furnace. Pieces were upset (flattened) slightly, then reheated, upset to 4 in. high, and punched with a 4-in. punch in an 8000-lb steam hammer. Further reheatings between forging operations on mandrels of increasing size in a 2000-lb hammer produced the ring. The key was in holding proper forging temperature.

Autoflight Line

LOCKHEED HAS MECHANIZED the "flight line," where jet aircraft is groomed for first flight. Even the jet engines are run up and tested in a long shed, under which 600-mph T-33 jet trainers are run on wheeled dollies. A tractor moves the dollies at desired intervals, and the planes come off even with fuel and oil checked, ready to be flown.

No Trade-In

PRIVATE-CAR OWNERS in Czechoslovakia must now sell their cars to State purchasing agencies when they are too old or damaged to be driven anymore. The purchasing agent, a government junk combine, reclaims still usuable parts and distributes them to garages and automobile agencies for further use. Usually, the car owner has to sell the complete vehicle to the State at the current price for scrap iron. However, if he should have a second car of the same make and model—most unlikely under present rules of ownership in communist Czechoslovakia, he may, upon express permission of the agency, retain a few parts for immediate replacement, but none for reserve.

Traffic Engineer

AN ENGINEER, just out of college, explained to the traffic-court judge in these terms:

"Circumstances got beyond my control. The wheels accelerated in one plane while the force of gravity operated at an angle to the rotating plane. This produced a rotation perpendicular to the plane of the wheel rotation."

The judge pondered this several long moments and asked, "What does all that hokum mean?" Said the engineer: "My car skidded."

Quotable quote

THERE COMES A TIME when it becomes advisable to shoot the engineer and start production.

Radioactivity Stops Fires

LATEST DEVELOPMENT in fire detection is a predetector head developed by Pyrene—C-O-Two. Unit contains minute amount of radioactive material in two chambers, one open to the atmosphere, the other sealed. Ionized air in the chambers becomes electrically conductive and system is adjusted to exact electrical balance. But if any smoke or combustion gases enter the open chamber, the balance is upset and a cold-cathode tube becomes conductive, activating a relay to ring bells, flash lights, close doors, operate extinguishing systems, or perform other protective functions. Unlike most other systems, the new device does not require heat or flame to set it off. Invisible combustion gas will operate it, just as well as smoke from smoldering or fast-burning fires.

Auto Springs

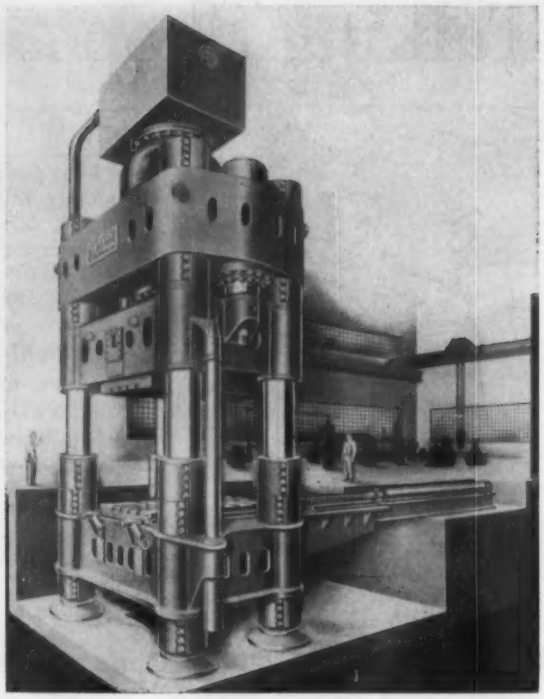
A RECENT SURVEY indicates there are about 600 springs in an automobile. Beyond the familiar ones on axles (some now being replaced by torque bars), there are springs in brake assemblies, window and door mechanisms, trunk door, body trim and molding (spring clips), seat adjustment, instruments, shift rod and tie rod, clutch, ball joint, horn button, headlights, pressure regulator, gear shift, and all over the engine.

Pink Shirt

HENRY FORD II, says the "Detroit Free Press," came back from the auto show with a sample of fabric he fancied. He sent it to the design department for analysis. Said the report, in effect: "The material is not up to Ford standards and the color is suitable only for the type of person who likes charcoal suits and pink shirts." Ford sent for the writer of the report, and met him at his office door, wearing (you've guessed it) a charcoal suit and a pink shirt.

Field Report USA:

KENOSHA, WIS: both Hudson and Nash cars move down the same "make-up" line at American Motors Corp, where wiring is installed and steering and front-ends added



TORRANCE, CALIF: This 8000-ton hydraulic forging press, installed at Harvey Aluminum Co as part of the AF Heavy Press Program, has top and bottom ejectors, effective die bed of 110 in. x 70 in., 72-in. stroke

East Coast...

"No comment" on Mr Talbott . . .

East Coast aviation firms refuse to comment one way or another on Air Secretary Talbott's recent edict of "no new defense plants on the East and West Coasts." However, they do say this: aircraft plants are trending to under-populated areas—not because of defense dispersion, but because jet engine noise has raised a lot of neighbor problems. When Coast aircraft firms get around to testing rocket engines with a 75,000-lb thrust, they can't do it in someone's back yard. One airframe maker has already had to pay damages to annoyed neighbors. So, Mr Talbott or no, the aircraft companies have taken it upon themselves to move to comparatively deserted inland areas (Pratt & Whitney to a remote area near Middletown, Conn, and Curtiss-Wright to a similar area outside Harrisburg, Pa) for these reasons: no noise complaints, better security, plenty of elbow room.

Eastern briefs . . .

Pittsburgh reports business activity today is almost 66% greater than it was at 1954's low point—June . . . Commercial Controls Corp, Rochester, N Y, is completely revamping and modernizing its production, engineering and office facilities . . . Norton Co is making its fork truck drivers undergo extensive driving tests, including an obstacle course, before they can get a company-issued license to drive . . . Radio Corp of America expects its 1955 sales to top $1 billion for the first time . . . Two Philadelphia machine shops were destroyed in a recent four-alarm fire. Evans Specialty & Machine Shop burned following an explosion of undetermined origin, then the fire spread to De Russ Machine Products Co, causing damage estimated at $250,000 . . . David Rapoport, whose plans to turn the old John Wanamaker store into a permanent New York machine tool display center fizzled, announces the store will be used as a hard goods merchandise mart (electrical supplies, housewares, appliances, tools, etc) patterned after Chicago's Merchandise Mart . . . Bethlehem Steel reports record first quarter sales . . . New England firms report orders for machinery (excepting electrical) are up 11% over a year ago. Fabricated metals orders are 29% ahead of last year, and electrical machinery orders are up 23% . . . Mechaneers Inc, Bridgeport, Conn, has installed ultrasonic equipment for machining, tapping, drilling, and hobbing carbide and hardened tool steel—claims it's the only such equipment in an eastern contract tool and die shop . . . Morse Twist Drill & Machine Co, New Bedford, Mass, has settled with Local 277 United Electrical, Radio & Machine Workers, for 4¢ an hour increase, and Columbus Day as a 10th paid holiday.

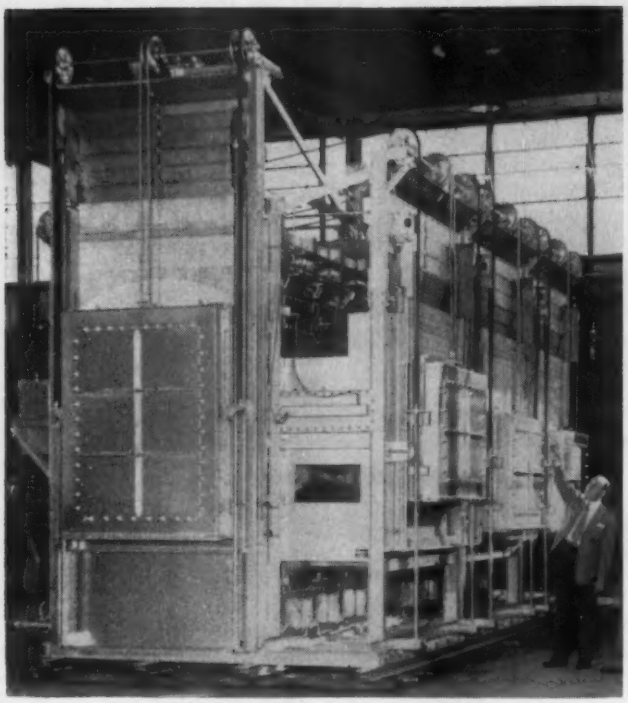
West Coast...

Talbott ain't popular . . .

LOS ANGELES—Southern California earthquakes have never rocked this area more than Air Secretary Talbott's policy of "no further expansion of the California aircraft industry." Said Los Angeles Chamber of Commerce President Carl Miller, "The Secretary might better spend his time in plans for protecting the important national defense establishment than in plans for its destruction."

Thinking is split on Talbott's statement. One side thinks it indicates nothing new — dispersal has always been part of defense thinking — but others say Talbott's idea is impossible. You can't maintain level aircraft output by replacing each phased-out contract with a new one, because of contract negotiation time.

Arguments against Talbott's policy: this area's concentration of know-how, and the complex of related industry (notably electronics) are too valuable to undercut. The area is less vulnerable to air attack from Europe than most of the U S. Southern California's reliance on



CHULA VISTA, CALIF: plyboard is stretched over series of iron straps and pot logs to form this painting platform at Rohr Aircraft. Device can be shifted at night so that painting can continue uninterruped following day

PROVIDENCE, R I: biggest electric steel forging furnace, built by C I Hayes Inc, will heat steel billets in a controlled atmosphere for Wyman-Gordon's 50,000-ton press. Chamber takes 10,000 lb of steel billets up to 16 ft long

aircraft (Talbott said 25% are employed in it) is much less than Detroit's on autos, Pittsburgh's on steel.

The other side: one prominent electronics official says "unfortunately for us, Talbott has good reasons. If we assume there's no war coming, then it's all right to concentrate in one area." He and his co-thinkers believe affected firms should trim to the wind, not fight it.

If Talbott means it, his policy's effect on the area will be profound —not only on aircraft, but on suppliers, home builders, merchants, and the average man.

Many think it's the small company that will get it in the neck. The big airframe makers and electronics firms can afford to open branches in other parts of the U S—some already have.

That avionics battle . . .

North American's recent announcement that it would make fire control systems for its F-86-K Sabrejet has caused a flare up in an argument over division of work between airframe makers and electronics companies. Feeling of electronics people is that aircraft primes are using the Weapons Systems concept to get into the electronics business—duplicating existing facilities at government expense.

North American President J L Atwood denies this, says his firm moves into avionics only when the equipment is unobtainable elsewhere, isn't trying to make a "big business bigger."

Some airframe people think it's high time they got into avionics, since this represents a greater and greater share of the cost of an aircraft or missile. Douglas Aircraft is an exception, says it "goes to specialists for specialties." Not all electronics makers are alarmed. Some feel there's a limit to how far airframe companies can go, and that the Air Force is now wise to the dangers of the Weapons System method of procurement.

Detroit...

What's Your Big Worry?

DETROIT—*AM* asked that question of several chosen-at-random Michigan Metalworking firms, came up with few heartfelt complaints, and very little uniformity. In fact, several candid spokesmen could think of no major headaches at all—although the possibility of an auto strike admittedly raised some qualms.

Among fabricators, there's a tendency to fret about growing steel shortages, although most said "good connections" have kept them out of trouble so far. One big stamping plant complains "the big companies are doing more and more of their own work and subletting less." A scattering of spokesmen complained of "fluctuating prices and low-priced competition."

One source said he isn't worried about an auto strike because GM, Ford and Chrysler are now letting contracts previously held back because of strike fear. What contracts? No comment.

Chicago...

It looks pretty good . . .

CHICAGO — A quick sampling of firms in several Metalworking fields in the Chicago area comes up with this situation report:

- **Stampings:** Poray Inc (stampings for domestic appliances and radio-TV industries) currently is operating 30% above this time last year. Major markets are really rolling; sales outlook is excellent; employment is up.
- **Metal fasteners:** H M Harper Co, makers of non-ferrous screw fasteners (mostly specialty items) says first quarter sales this year are only slightly ahead of a year ago, but outlook and backlog for the second quarter are "very strong." Harper is cautiously optimistic about the rest of the year.
- **Screw machine products:** one top firm, supplier to the auto industry, says business is up materially

Field Report USA:

from a year ago—but isn't quite keeping pace with spectacular auto boom.

- **Sheet metal fabricators:** one big Chicago firm, that also makes some stampings, says business is very slow—but that's traditional for this time of year. This firm isn't too optimistic about the rest of the year, either.
- **Non-ferrous foundries:** one smallish aluminum foundry reports it worked its first full week in a long time recently. Up to then, it had been working three- and four-day weeks for many months. This seems to be pretty typical of other nonferrous foundries, and ferrous foundries, too.
- **Plumbing and heating:** business is booming in hot water heaters, air conditioners, domestic furnaces and plumbing—all following the construction boom.
- **Appliances:** typical of this skyrocketing field is Chicago's Hotpoint Inc, which has broken all its sales and output records in recent months, expects current demand to hold up at least through the balance of 1955. Ranges, refrigerators and washers are leading the way.
- **Steel output:** Chicago steel production has set two new records: (1) last week in April established a weekly record of 440,300 ingot tons, (2) and March output was at an all-time monthly high of 1,866,300 ingot tons. Inland Steel set a new monthly high in April. Youngstown Sheet & Tube's Chicago plants are operating at 108.3% of rated capacity, averaged 96% in first quarter.
- **Tool and die:** conditions are still spotty. Backlogs are 'way down. There could be a strike in Chicago shops soon. Both labor and management are said "to have their backs up" on this one. For one thing, Chicago wages are the highest in the U S and management certainly doesn't want to see them go any higher.

Chicagoland briefs . . .

Elgin National Watch Co plans to distribute $486,442 to 4369 employees eligible to receive bonuses this year under its profit-sharing plan. Since the plan was started in 1936, Elgin has paid out over $6 million in bonuses . . . Hallicrafters Co, Chicago, will come out shortly with a color TV set pegged to sell for $695. Board chairman W J Halligan says color TV is here to stay, predicts 100,000-150,000 color TV sets will be sold this year . . . Chicago Malleable Casting Co's block-long foundry and milling facilities were badly damaged recently in a $200,000 fire . . . Bodine Electric Co, Chicago fractional hp motor manufacturer, is 50 this month . . . Caterpillar Tractor Co will demonstrate $2 million worth of earthmoving equipment to dealers at its Peoria, Ill, proving grounds June 6-10 . . . Inland Steel chalked up new sales, earnings and output highs for the first quarter, expects to keep it up throughout 1955 . . . ASME and the American Society of Lubricating Engineers will hold their second joint Lubrication Conference at the Antlers Hotel, Indianapolis October 10-12. Principal topics will include bearing instability, hydrodynamic lubrication, and rolling contact bearings.

Cleveland . .

Labor hiring rate is up . . .

CLEVELAND — For the first time, Cleveland's labor hiring rate crossed the $1.50 mark, practically double WWII's frozen rate, on April 27. Last year at this time the rate was $1.464. Today, Cleveland plants are putting in more working hours than at any time in the last 18 months (April average: 40.7 hrs) and this rate will be maintained at least through May. Cleveland production workforce is estimated at 203,600.

Pulling out the props . . .

IAM's 632 striking employees of the Cleveland Welding Co have been told, while still out, that the firm's Bicycle Division has been abolished. This means fewer than 450 of the 632 workers will be taken back when the walkout ends. Work stoppage occurred when the firm sought to change its production standards and job evaluation while IAM was demanding a 15¢-an-hr increase and fringe benefits.

Cleveland briefs . . .

Eaton Mfg Co has started delivery to Sears, Roebuck of the Eaton-designed and manufactured auto air conditioner (initial order: 100,000 units) that can be adapted for home and office use. This is one of Eaton's diversification moves to get its eggs out of the auto basket. . . . Hercules Steel Products Corp and Ohio Steel Products Co are talking merger. Both firms are located in Galion, Ohio. Both make truck dump bodies and hoists. Both have subsidiaries: Hercules' Star Mfg Div makes food handling equipment, and its Galion Metallic Vault Division makes burial vaults. Central Ohio's Galion Allsteel Body Co makes truck bodies, its Mansfield Metal Products Division is a jobbing metal fabricator, and its Austen Overshot Loader Division makes overhead loaders . . . Pressed Metals Institute will move into its new home in the 3600 block on Lee Rd, Cleveland, July 1. Almost-next-door neighbor will be Heald Machine Co's new district offices, also slated for July 1 occupancy, at 3669 Lee Rd. . . . Gas Machinery Co has a contract to furnish two preheat furnaces for Sharon Steel Corp's Farrell, Penna, plant.

Southeast...

Machine tool sales pickup . . .

ATLANTA—Machine tool and metalworking equipment sales are picking up throughout the Southeast, following an exceptionally bad fourth quarter 1954. Machine tool distributors report upswings for the first four months of 1955 to levels 15% above 1954 in some cases. One distributor says April sales were 10-15% above a year ago, and deliveries in the last 30 days have "stiffened considerably." Another distributor reports that customers who a year ago were looking for used machine tools are now making inquiries on new equipment. Still another reports it's doing a brisk business in the metal fabricating machinery field.

Machine tool people are generally optimistic. One reason is that higher wages and mushrooming manufacturing in the South are making management down here far more cost conscious than before. Tool people reason that today Southern customers are no longer shopping for the cheapest tool that will do the job. Now, they're looking for high production and low unit costs. As a result, this "machine tool desert" may turn into one of the top markets soon.

Labor unrest . . .

If GAW succeeds in Detroit, and the $1.25 minimum wage law in Washington, it looks like the South is in for trouble. GAW fever could spread first to the auto assembly plants down here, then possibly to the steel plants in Birmingham, and finally to the aircraft firms. Most Southern businessmen will go along with a minimum wage increase to $1, but balk at $1.25.

News of Metalworking . . .

MACHINE TOOL BUILDERS MEET:

Every Eye Is on Chicago in September

The above photo of the stage back drop at NMTBA's 53rd Spring Meeting gives you a pretty good idea of what's uppermost in the minds of machine tool builders these days — the Machine Tool Show in Chicago this September. But they found time to talk over Washington problems and hear what GM expects from machine tools, too

CHICAGO—The coming Machine Tool Show and Washington problems that confront the machine tool industry were the main topics discussed at the 53rd spring meeting of the National Machine Tool Builders' Association at the Edgewater Beach Hotel May 4-6. A talk on what General Motors expects from the machine tool builder by Rodger Emmert, executive in charge of facilities and processes of GM's manufacturing staff, was a high spot of the program.

A "guaranteed annual increase in the rate of productivity," with a saving of more than $1 billion a year, can be made by the metalworking industries by undertaking a sound and comprehensive program of replacement of obsolete machine tools, M A Hollengreen, association president and president Landis Tool Co, declared. This increase in productivity is far more important to the members of Walter Reuther's union than is a guaranteed annual wage.

Mr Hollengreen said that automation is just a new word for mechanization. Call it what you will, automatior or mechanization, it means a gain in productivity stemming from supplying workers with better and more efficient means of production. Today, metalworking plants are paying too much for the doubtful pleasure of retaining old machines. They still are not aware of the excessive cost of not having modern machines that can make the most of modern tooling.

Washington officials not only are conscious of the role that the machine tool industry must play in the nation's defense, Mr Hollengreen stated, but are alert to the "need to cooperate with us in making our contribution to defense truly effective." With this favorable atmosphere in Washington, it is an ideal time to have a show.

The Machine Tool Show at the Amphitheatre in Chicago Sept 6-17 will be "a three-ring productivity circus," William E Rutz, chairman NMTBA show committee and executive vice president Giddings & Lewis Machine Tool Co., reported. It will be "the world's best investment in action," the success of which will depend upon the right kind of people, and enough of them, seeing it. In addition to advertising and publicity, thousands of information booklets and advance registration cards are being distributed in every part of the country and in every industrial nation overseas by the builders' sales engineers and machine tool distributors. Visitors are asked to make their Chicago hotel reservations as early as possible.

Machine tool electrical standards are now being revised by the NMTBA electrical committee, Tell Berna, association general manager, reported. The new standards will depart substantially in general arrangement and content from the earlier standards, but no important changes will be made in requirements. Methods of applying electrical equipment to machine tools will not change.

(Continued on next page)

It is hoped that the new standards will be approved by the electrical inspectors so that no matter where machine tools go, the inspectors will find the job satisfactory.

Mr Berna said that the International Standards Organization has a Technical Committee 39 working on such standards as tapers for tool shanks (for which the American standard probably will be accepted), lathe centers, tool holders for lathes, T-slots for machine tools, machine tool feeds and speeds, and machine elements. The American industry was represented at an ISO meeting in London in March as a full member. Next meeting of Technical Committee 39 is likely to be in Paris next year. Germany and France have engineers working full-time on international standards.

There is a growing acceptance of the view that the investor in new machine tools should be allowed to charge off the cost over the expected profitable life of the asset rather than over the physical life. Everett Hicks, chairman government relations committee and vice president and manager Grinding Machine Division, Norton Co, stated. He said that the Treasury Department has acknowledged that Bulletin F is out of date as a criterion for determining the life of machine tools and is to be revised, with the aid of the machine tool industry. Revenue agents have been told not to regard Bulletin F as the Bible for enforcement of depreciation policies.

The machine tool industry is strenuously opposed to the recent Executive Order allowing domestic bidders a price differential of only 6% over foreign bidders on government procurement, Mr Hicks said. Such action would have the effect of weakening the industry, reducing its capacity, and increasing dependence on foreign sources. The Defense Department is strongly opposed to foreign purchases; and Dr Flemming, ODM administrator, is believed likely to rule against such procurement. A test case is now pending—46 radial drills for the Air Force, with a foreign source as low bidder.

Unsatisfactory progress was reported by Mr Hicks in the industry's attempt to get standardized terms of procurement from the armed services to be applied in event of a major mobilization program involving large numbers of machine tools. The same unsatisfactory situation exists in suggested revisions of government contract forms.

The government's defense materials system, as it now exists and as it will operate in event of war, was outlined by Ralph R Baldenhofer, director Metalworking Equipment Division, BDSA. At present, it is limited to the Defense Department and Atomic Energy Commission, but in event of emergency would be expanded immediately to include the entire production of the machine tool industry. At such time BDSA would be ready to handle machine tool manufacture the same as guided missiles, tanks or guns.

Though BDSA has done everything possible to hold to a minimum the leasing of machine tools for non-defense work, Mr Baldenhofer emphasized that many government-owned tools in plants in which the lessee has a limited amount of defense work and the tools could be used on non-defense projects. In such cases, BDSA cannot take action unless the contract comes up again.

BDSA is in the midst of developing a new pool-order program for machine tools to be operable on the same day an emergency occurs.

"Sometimes we regard fine measurements as an annoyance," Louis Polk, president Sheffield Corp and first vice president NMTBA, said in an address on "The Seventh Decimal Place." "Used properly and with self-restraint, they are good instead of bad." There is greater recognition all the time of the need for agreement in basic accuracy between plants and between departments within the same plant. "The machine operator wants and needs as much tolerance on a blueprint as he can get, and maybe a little bit more if no one is looking. After all, the inch he is working to is his inch, which may not have been checked against the plant's reference gages early that morning."

The plant's reference gages, Mr Polk declared, are usually made in another plant having its own gages, which were based, only ultimately, on units of measurement certified by the National Bureau of Standard's Engineering Metrology Section at Washington. "And that, in turn, establishes the base in a series of reference gages and standards making up the ascending echelons of precision manufacture." Right now, Mr Polk stated, grinding, honing and other machine tools and measuring equipment are being made enabling economical production and classification of parts to plus or minus 5 millionths of an inch or less.

Metal Powder Group Talks Production; Announces Scholarship

PHILADELPHIA, PENNA — More than 800 members and guests of the Metal Powder Association met here from May 10-12 for the 11th annual meeting and show, which included 25 exhibitors. Because of the distinct differences of interest, the sessions were divided into two groups — manufacturing and electronics.

Papers of particular value to Metalworking manufacturing people included: Finishing and Plating, by C C Cohn, Colonial Alloys; Machinability of Sintered Bronze, by W A Irvine, Maytag; Pre-alloyed Steel Powders and Applications, by G A Roberts and A H Grobe, Vanadium-Alloys Steel; Carbide Tooling for Pressing, by T A Wilson, National Carbide Die; Economic Production of Metal Powder Parts in Small Volume, by B I Horton, Pitney-Bowes; Effect of Copper Additions on Iron Powder (Sintering for dimensional control), by P U Gummeson, Hoeganaes Sponge Iron; Iron Powder Industry in Europe (including tooling methods — see p149 for details), by S I Hulthen, Hoganas-Billesholms Aktiebolag; Powder Producer Looks at Titanium, by J F Sachse (read by J Haertline), Metals Disintegrating, and Fabricator Looks at Titanium, by H W Dodds, Brush Laboratories.

Direct reduction of ore, which results in a powder form of commercially pure, or purer, metal and by-passes the smelting operation, holds considerable promise for greatly expanded application of powder techniques in the future manufacture of metal parts. Thus, in addition to the present rapid growth of these techniques in Industry, many manufacturers are studying powder metallurgy as a hedge against competition in the future.

At the show, the first Metal Powder Association scholarship, amounting to $500, was awarded to Donald C Larson, University of Washington, to enable him to pursue one or more courses in the science of powder metallurgy.

WHAT GM WANTS FROM MACHINE TOOLS:

Tool Builders Hear GM Master Mechanics' Suggestions

CHICAGO—Suggestions for future improvements in machine tools, based on an opinion survey of GM master mechanics, were given to the NMTBA at its annual meeting by Rodger J Emmert, executive in charge, facilities and processes staff, General Motors Corp.

Mr Emmert said that a "partnership" exists between machine builders and automobile companies, based on a common desire to improve the customer's product and reduce his costs. Therefore, he welcomed the opportunity to discuss GM's needs and particularly some of its forward thinking that will affect machine tool design.

This, he said, is what GM wants:

● Improved product quality is at the head of the list. Statistical methods of analysis often point to certain machine tools that are unable to maintain proper tolerances. GM's desire is to have machinery which will maintain smaller tolerances, which will make every part more nearly like all its counterparts.

● Faced with growing costs for materials and labor, GM hopes that the machine-tool builder will show a great deal of creativity in developing new ideas and better methods.

● Specifically, GM wants equipment that will permit an operator to produce more parts or accomplish more desired work than on present equipment. And GM wants better ways of loading or passing parts from one operation to another without the aid of an employe. An insistent demand is developing for means by which a machine will be automatically adjusted to maintain size. Automatic gaging at or near the machine should be sturdy, accurate and reliable, free from wear so that it will not need constant adjustment. To make this feedback principle from gage to machine workable, and in order to reduce the increment of adjustment which must be made to maintain close tolerances, *friction between movable elements of machines should be reduced.*

● GM desires great reliability in order to maintain production. The machine should be easy to repair and maintain.

● The investment must be considered in relation to the amount of work that can be accomplished and the cost of labor.

Only 17% of General Motors' 3½-billion postwar modernization and expansion program came from outside funds. The balance came from profits. The corporation continually seeks means by which it can increase the employe productivity — that means the purchase of new facilities whenever reduction of costs is indicated or increased capacity is needed.

What Master Mechanics Ask

GM engineers have set down standards and specifications of elements they think should be incorporated in mechanical systems. It has classified these as electrical, hydraulic and pneumatic standards.

What do these specifications seek to accomplish?

● Components rugged enough to stand up under production pounding.

● Components so located that they are not damaged by chips, coolant, oil and dirt.

● Parts so located that maintenance people can get at them readily for adjustment and repair.

GM recently made a survey of its master mechanics to determine what they desired in the improvement of drilling, milling and turning machinery, with these results:

● Of recommendations submitted, 34% were for improvement directed toward reducing maintenance; 27% for improvement of accuracy; 21% for greater flexibility and operating ease; and 9% were for the provision of greater operator safety.

● Regarding standardization, the most prevalent suggestion was for a standard spindle nose for attachment of multiple heads.

Rodger J Emmert

Power Drilling Needs

The second request, which applies to power drilling units, concerns the standardization of mounting bases, attaching holes and the dimension of base to spindle.

● Nine suggestions for improvement were: (1) greater rigidity and strength, (2) centralization of lubrication system, (3) better means for chip disposal, (4) larger spindle nose, (5) higher spindle speeds, (6) greater spindle horsepower, provided greater rigidity accompanies it, (7) improved spindle and feed drive to reduce chatter, (8) chip protection on moving parts, bearings and ways, and (9) elimination of lubrication leaks.

The most frequent suggestion received for standardization of milling machines was for a uniform location of T-slots in the table.

GM's master mechanics thought that consideration should be given to those elements which affect: (1) the cycle of operation and quality of work produced, (2) maintenance and (3) stocking and service.

They requested these improvements:

● Increased power, speed and rigidity to eliminate vibration and chatter, and permit optimum use of carbide tools.

● Improved chip handling and coolant cleaning by improving means of removing chips from machines and by the addition of filters or a centrifuge to remove minute chips from coolants. These chips cause clogging of coolant lines and passages, ruin coolant pumps and result in galling and scratching of gibs and ways.

● Improved means of applying coolant to work and elimination of overflow and splash.

● Improved alignment of indexing mechanisms and turrets.

● Improved safety features, elimination of loose wrenches, and addition of mounting bosses for better guard application.

● Improved seals to keep coolant from getting into lubrication and

WHAT GM WANTS FROM MACHINE TOOLS (continued)

hydraulic systems. Centralization of lubrication systems to one or two points.

- Better means of levelling and maintenance of level after initial installation.
- Improved clearance for accessories and tool setting.
- Improved lubrication systems.
- Better accessibility to high maintenance components. This suggests disconnect couplings and attachment plugs, so that components can be easily removed and others installed.

In analyzing suggestions for standardization of components, the following ideas were noted:

- Standardization of tool mounting for interchangeability between machines. This includes pilots and bolthole sizes, and location of toolholders and adapters on turret faces for hand screw and semi-automatic turret lathes.
- Standardization of work-spindle pilots.
- Standardization of spindle noses to permit interchangeability of chucks, faceplates, etc.
- Standardization of collet shapes, feed fingers and pushers.
- Standardization of center distances from slides to spindles for interchangeability of tools.
- Standardization of work-head and tailstock center tapers.

Many suggestions have been made to standardize working dimensions. GM has no desire to limit ingenuity or freedom to work out new designs, merely those areas with which GM must work. Recent experience with setting up facilities for production of military items emphasizes this thought. Modifications of tools to suit machines is a costly and time-consuming job, and time may not be available.

GM is concerned about fire hazards. When fittings fail, oil is atomized and sprays over large areas. If the vapor is ignited a terrible fire results. There may be no chance for employes sprayed with oil to escape. Right now GM is having a spirited discussion about the use of non-flammable fluids in its hydraulic systems. General managers insist on their use, while mechanical people say GM's equipment will not stand up when they are used. There are many problems involved in the use of non-flammable fluids in hydraulic systems but GM is going to be more insistent on the use of such a fluid.

Production machines should be so designed that lubrication can be accomplished with minimum interruption to production or no interruption at all. Systems of lubrication should be all-inclusive, so that bearings will be lubricated from central points.

The latest problem being discussed at GM is elimination of vibration, which affects surface finish, the rate of feed and the life of the cutting tools. Dynamic balancing should be considered, because today we are operating at higher speeds and feeds than ever before.

AF HEAVY PRESSES: 50,000 and 35,000

Air Force's Heavy Press Program is really rolling now—with the world's biggest press, a 50,000 tonner, and a 35,000 tonner forging aircraft wing spars at the Alcoa-operated Air Force plant 47 in Cleveland. This marks the program's halfway point

CLEVELAND—First complete plant in the Air Force Heavy Press Program went into operation here May 5. Representing the halfway mark in the program, Plant 47 of the Air Force is built around a 50,000- and a 35,000-ton press and represents a total investment of $40 million.

More than 700 invited guests from government and industry attended the ceremonies, watched the presses officially begin production, and toured the plant while, for several hours, the two presses forged wing spars at a steady rate. Operator of the plant is the Aluminum Co of America (Plant 47 is adjacent to Alcoa's Cleveland forging plant).

The Mesta 50

In the center of the new plant is the $7.5-million, 50,000-ton Mesta hydraulic press. Weighing about 8000 tons, the press has eight main operating cylinders and is 87 ft high (36 ft below floor level, 51 ft above). The concrete caissons extend 78 ft below floor level to bedrock.

The movable die table is 12x26 ft. Manipulators insert the stock from one side of the press and remove it from the other to speed operation. Maximum press stroke is 6 ft, with a 1-ft working stroke designed to operate at 30 cycles per hour.

During the demonstration the press was performing a blocking operation on wing spars for the Convair F102. These spars weigh about 700 lb and the press maintained an initial rate of about 20 spars per hour.

The United 35

Special design to limit eccentricity has been incorporated in the 35,000-ton press built by United Engineering & Foundry at a cost of about $8.3 million. The press is 76 ft high (42 ft above floor level) and has a platen area of 12x24 ft.

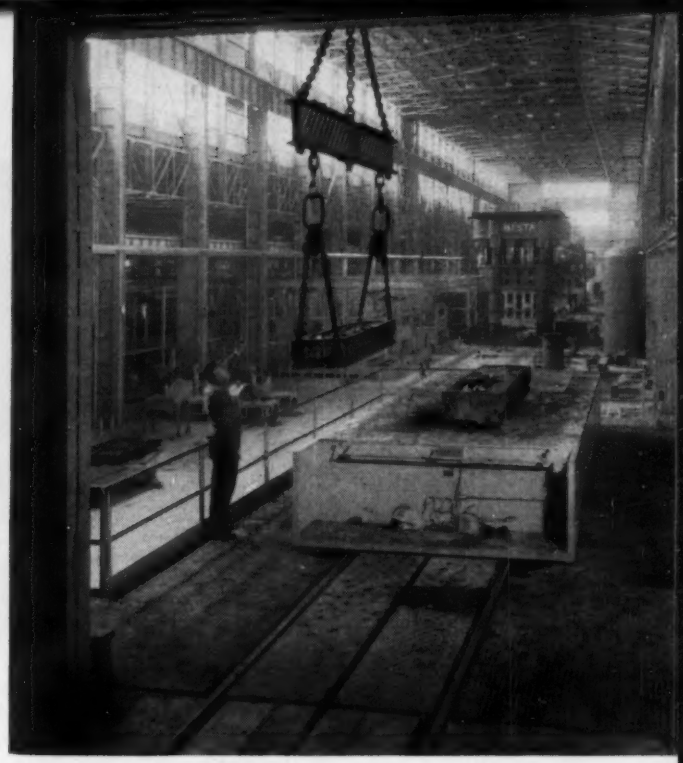
The specifications call for this press to withstand eccentric loads up to full pressure up to 2 ft off center on the long axis and 1 ft laterally. In other words, the press is designed to withstand a 70,000 ton-ft eccentric moment.

Four equalizing cylinders at the corners of the platen are cross-connected diagonally during the working stroke so that as the crosshead tends to move out of level a reaction is set up in the closed circuit to equalize the eccentric moment. These same cylinders are connected in parallel to serve as lifting cylinders during the return stroke.

TV Inspector

A Dumont closed-circuit TV system operates from the foundation to the control pulpit providing the operator with a constant check on eccentricity. A spot of light operates on a ground glass screen provided with a diamond-shaped limit area. This device is designed to warn the operator when too much eccentric loading occurs and to assist in re-

THE PRESSES: foreground is the 35,000-ton press built by United Engineering & Foundry Co. Background is the Mesta-built 50,000-ton press



100-TON TROLLEY, electrically operated, transports dies from die shop to main press bay. 200-ton crane is shown moving a die for installation on press

Tonners Go to Work at Alcoa Cleveland

positioning the dies to minimize the condition.

$14 Million Die Shop

About 22% of the 12 acres of floor area are devoted to the die shop. Basic die-sinking equipment includes 17 large machines in addition to which Alcoa will make use of the die facilities in the adjacent plant.

Eight model BG-22 Pratt & Whitney Keller machines include three 5x10 ft, three 7x16 ft, and two 7x20 ft. Four Cincinnati Hydrotels include two 48x144 in. vertical head, a 7x18 ft horizontal, and a 10x28 ft dual-head horizontal now being installed.

There will be two 150-hp Ingersoll table-type openside milling machines. One is 130 in. by 9x20 ft and is already in operation. The larger, 130 in. by 13x30 ft, is being installed.

Giddings & Lewis has a 120x96 in. by 40 ft planer with two rail and two side cutting heads and an 8-ft vertical boring mill with GE Amplidyne tracer control. Other heavy equipment includes a 10x24 ft Kaukauna heavy-duty drilling and tapping machine and a Monarch 20x72 in. engine lathe.

Still to be installed is a die layout machine being built by Consolidated that will include closed-circuit TV for optical work on the large dies.

Extensive installations of conventional equipment have been necessary for the preparation of wood and plaster models, metal templets, and for maintenance work in the plant.

Heating and Trimming

Furnace equipment includes 19 large chain and car-bottom units built by US Furnace. In addition there are nine Swindell Dressler special radiant-type car-botton furnaces for heating dies.

In addition to a 2000-ton trim press there are six straightening presses including 100- and 300-ton Lake Erie and 50-ton Bliss.

What Next?

With these presses and the 35,000-ton Loewy press in the Wyman-Gordon Grafton plant already in operation, and the 50,000-ton Loewy press at Grafton scheduled for operation this summer, there is much speculation about revival of the 75,000-ton press, or of larger sizes.

Air Force representatives insist that they want operating experience with these four presses before making any decision.

But a couple of acres of open floor space in the main press bay of Plant 47 is a silent indication of the confidence that the Air Force has in the future of heavy presses.

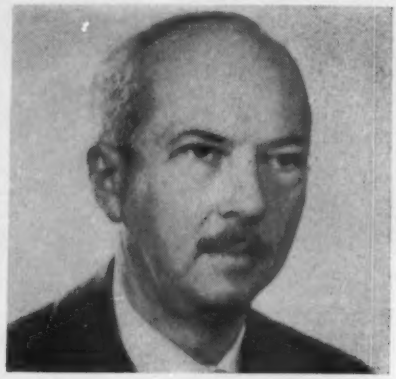
Commercial Business?

Although designed and built for aircraft work, Alcoa is confident that commercial business for the giant presses will develop. They cite work now being run in quantity on their 15,000 and 8,000-ton presses which includes Cadillac wheels and truck wheels as indicating the possibilities.

General Rawlings, head of the Air Materiel Command, has pointed out that we will never know the true value of the program. If a large forging replaces a complex assembly and saves substantial sums, the saving will show up in the cost paid by the government for the plan. But this saving will never show up in the balance sheet of the press plant that made it possible, for the plant will be paid only for the forging, not for the assembly it replaced.

Cost aside, however, Gen Rawlings said as he inspected the $40-million plant, large forgings from such presses represent the only practical engineering construction in some of the forthcoming planes.

KEARNEY & TRECKER CORP APPOINTMENTS . . Ralph W Burk (left), vice president, sales and manufacturing, to the new post of executive vice president; and **Raymond L Bischoff,** secretary and treasurer, elected, in addition, financial vice president



McClure Kelley, executive vice president, Baldwin-Lima-Hamilton Corp, has been elected president; he succeeds **Marvin W Smith,** named chairman of the executive committee. (Additional B-L-H appointments listed below)

Names in the News . . .

James F Magin, vice president and a director of Square D Co, has been appointed general manager of the companv's Industrial Controller Division, Milwaukee, manufacturing electrical motor controls for automation systems.

R C Mahon Co (Detroit) elections: **R C Mahon,** founder and president for the past 43 years, to chairman of the board; **Walter F Sheetz,** executive vice president and sales manager, to president; **Harry J Lawther, Jr,** to secretary-treasurer; **C L Chubbuck,** first vice president; **R J Kraemer,** second vice president. Named vice presidents: **Frank J Bomerscheim, Leston F Chatfield, W Henry Duffy, David J Duggan,** and **Wallace Herdlein.**

Henry Disston & Sons, Philadelphia saw and tool manufacturer, names: Executive Vice President **John D Thompson** to head the company; he succeeds **Jacob S Disston, Jr,** elected chairman of the board to replace **S Horace Disston,** retiring after 55 years with the organization.

G T Flammia has been elected vice president and general manager of the Sossner Tap & Tool Corp of Lynbrook, NY.

Albert F Polk, vice chairman of The Sheffield Corp, Dayton, Ohio, has accepted an invitation from the Business and Defense Services Administration, Washington, to serve for a limited period as chief, Facilities, Distribution & Inventory Branch, Metalworking Equipment Division.

Baldwin-Lima-Hamilton Corp elects: **Robert G Tabors,** assistant general manager of the Hamilton (Ohio) Division, to divisional vice president; and **Arthur Clements,** vice president and general manager of Hamilton's Clearing Machine Corp, to divisional vice president.

Frank L Sonneman, factory manager of Triplex Screw Co, Division of the Murray Corp of America, Cleveland, has been appointed divisional manager, succeeding **Robert J Sheridan,** retired.

Miniature Precision Bearings, Keene, NH, promotions: **R H Carter,** associated with the company for the past sixteen years in engineering capacities, named chief engineer; **R H Gengenbach,** formerly assistant superintendent of the Sandusky plant of New Departure Division of General Motors, appointed manufacturing superintendent.

Charles B Tansley has been elected president of Bryant Machinery & Engineering Co, Chicago, succeeding **Martin J Wiora,** who moves into the newly created post of board chairman.

Frank J Hoder, Jr, sales manager of Micro-Precision, Inc, has been appointed general manager of Micro-Precision Division of Micromatic Hone Corp, renamed subsidiary at Evanston, Ill

H M Dardani, chief process engineer of Miniature Precision Bearings, Keene, NH, has been named vice president, manufacturing. (Additional appointments listed above)

Companies in the News . . .

Roy C Ingersoll, president of Borg-Warner, has in addition been named chairman of the board, a post vacant since the death of **C S Davis** last year.

Howard C Liebing, production control manager of National Tool Co, Cleveland, has been appointed sales manager.

Edward D Porter, a member of Norton Co's research and development department at the Chippawa, Ont, plant, has been appointed manager of the company's new electric furnace plant scheduled for January 1956 completion at Huntsville, Ala. **J Zach Higgs,** superintendent of the bauxite plant at Bauxite, Ark, has been named to a similar post at the Huntsville facility.

Howard H Casey, sales director of the Midvale Co, Philadelphia, has been elected vice president, sales.

Joseph V Delaney, director of the Lodge & Shipley Co, Cincinnati machine tool builders, and general manager of the Hamilton Division, has been appointed a vice president of the company in addition to his present duties

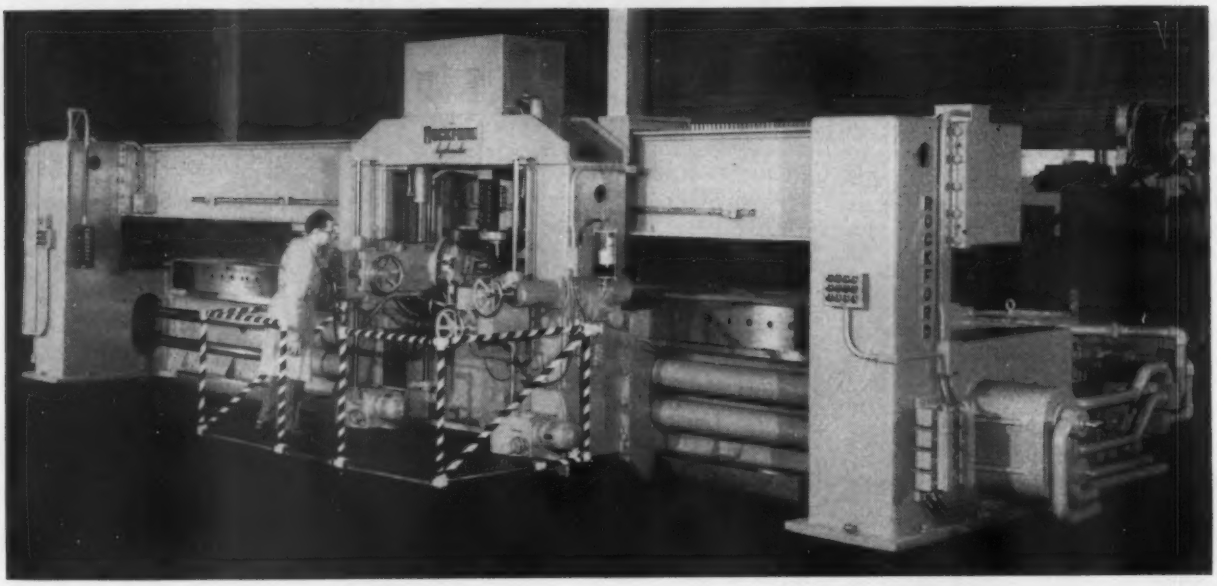
NEW PLANTS AND EXPANSIONS: Selas Corp of America is building a $1 million heat treating equipment plant at Dresher, Pa . . . **Lindsay Wire Weaving Co** has purchased a site at Mentor, Ohio, for a 45,000-sq-ft-plant . . . **Allied Products Corp** has moved its **Richard Bros Punch Division** and **Hercules Punch Division** into a new plant in Redford Township, just west of Detroit . . . **Dominion Bridge Co** will build a $1 million addition to its Burnsby, B C, Canada, steel fabricating plant . . . **Connor Spring Mfg Co** has opened a 5000-sq-ft precision spring manufacturing plant in Dallas . . . **Allis-Chalmers** will build a $9.5-million, 114,000-sq-ft electrical machinery facilitv at Terre Haute, Ind, and will use its Gadsden, Ala, plant to manufacture distribution transformers . . . **Technology Instrument Corp** of California has moved into a new plant at 11020 Sherman Way, North Hollywood . . . **Sundstrand Machine Tool Co** has just added 29,000-sq-ft to its machine tool manufacturing facilities at Belvidere, Ill . . . **United Engineering & Foundry Co** will spend $1 million or more in modernizing and improving its Youngstown, Ohio, plant in the next two years . . . **Miniature Precision Bearings Inc** will build a $500,000, one-story, 50,-000-sq-ft bearing plant at Keene, N H, tripling present space.

MERGERS, PURCHASES, NEW FIRMS: W H Nicholson & Co has purchased **Walter C Williams Co;** Philadelphia sheet metal fabricators . . . **M & E Mfg Co,** Indianapolis, has bought the paint spray business of **American Brake Shoe's Kellogg Div** . . . New Chicago firm, **Anocut Engineering Co,** will make automatic controls for electrolytic shaping systems . . . **Borg-Warner Corp** and **Byron Jackson Co,** pump and electronic component manufacturer, are talking merger . . . **J L Osgood Machinery & Tool Co,** Buffalo, has formed an affiliate, **Osgood Machinery Inc,** to distribute machine tools, presses and metalworking equipment in the Syracuse area . . . **E W Bliss Co** has formed a **Die Supply Division** out of its 1953 purchase of the **Die Supply Co,** Cleveland. It will continue to make and market the Dieco line of diemakers supplies . . . **U S Hoffman** is dickering for purchase of two engineering firms (names not disclosed) as a diversification move . . . **Dalton Gear Co,** Minneapolis, has been purchased by J K Weiner, vp of the National Association of Bearing Specialists, and president of **Minnesota Bearing Co.**

NEW AIR FORCE CONTRACTS: Ford Chicago plant $4.4 million for tools and equipment to make J-57 engines . . . **Sundstrand Machine Tool Co,** $6.4 million for constant speed drives and spares . . . **Hughes Tool Co,** $2.2 million for receivers, transmitters, antennae . . . **Radio Corp of America,** $1.4 million for gyroscope synchronizers . . . **Sperry Corp,** $1.7 million for transmitters . . . **Royal Jet Inc,** $2.6 million for jettisonable fuel tanks . . . **GM,** $2.3 million for gun, bomb and rocket sights . . . **GM Euclid Div,** $2.5 million for aircraft towing tractors . . . **Canadian Commercial Corp,** $1.1 million for modifying 59 aircraft engines . . . **Glenn L Martin,** $10 million for B-57E spare parts . . . **Burroughs Corp,** $1 million for sights . . . **Bendix Aviation Corp,** $1.9 million for indicators . . . **Loewy Construction Co,** $1.1 million for special tools for AF Heavy extrusion presses . . . **Westinghouse,** $13 million for compressor drive systems . . . **Consolidated Diesel Electric Corp,** $10 million for engine generator sets . . . **Kearfoot Co,** $7.2 million for indicators, controls and gyroscopes . . . **Convair,** $5 million for 28 F-102A jet trainers . . . **Continental Motors,** $4.4 million for engines and spare parts . . . **Avco Mfg Corp** $2.2 million for R-1820 installation engines . . . **Curtiss-Wright,** $1.1 million for flight simulators.

OHIO CRANKSHAFT CO, CLEVELAND, ELECTIONS . . C H Kimmel (left), vice president and general manager, named president; **M J Hoke,** works manager, succeeds Mr Kimmel

New Shop Equipment,



Rockford Introduces Hydraulic Plate Edge Planer

Rockford Machine Tool Co has developed a 14-ft-stroke hydraulic plate edge planer. The first delivered machine has a working capacity 14 ft wide and 7 in. thick. A vertical column is attached to either end of the bed and a long workclamp overarm, containing eight hydraulic cylinders, operates its four workclamp shoes. Bed of machine has two vertical ways on which are mounted the machine saddle.

Saddle reciprocates from 10 to 200 fpm and cutting speeds are infinitely adjustable. It carries right- and left-hand side head rail to mount two side heads which carry cutting tools. A welded-steel column top joins side head rails. Mounted on back of saddle are two heavy-duty double-end hydraulic cylinders.

Dual control system incorporated in machine enables operator to control most saddle movements and all head movements from stationary pendant or movable pendant on saddle platform. Both side headrails of saddle are equipped with handwheel-operated work locators.

The two side heads are hydraulically counterbalanced and each tool head has a hydraulic tool lifter. Feed for each is hydraulically controlled and electric rapid traverse is available in any direction. The company's patented triple circuit permits three speed ranges and three force ranges —all infinitely adjustable.

Since the saddle assembly moves on the bed and carries hydraulic equipment, a large reservoir has been built into the column top mounted on two side headrails. This system is a complete unit, including motor, pump, and necessary valving to operate side heads, even while saddle is traveling at 200 fpm.

Rockford Machine Tool Co, Rockford, Ill

Besly-Welles Makes Shorter-Length Tap

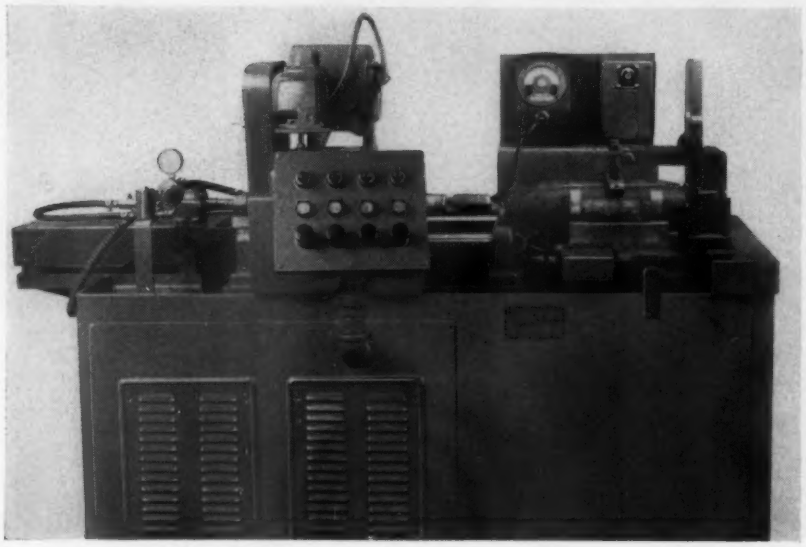
A shorter length tap which need not be altered before use in screw machines has been made available as standard item. Both shank and threaded portions of stub tap have been shortened—shank is same size as nominal OD, permitting standard size bushings to be used. To assure accurate alignment in the toolholder, the shank is made concentric with the threaded portion. Since it is not necessary to cut off forward threaded portion of stub tap, chamfer and back taper are maintained. Squares, except for two small driver flats at end of tap, are eliminated.

Stub tap is made in fractional sizes from ¼ in. through 1 in. and machine screw sizes from No. O

through No. 14, and to conform to recent standards of the National Screw Machine Products Association.

Besly-Welles Corp, Beloit, Wis

Materials and Parts . . .



New Superior Honing Machine Provides Automatic Air Gaging

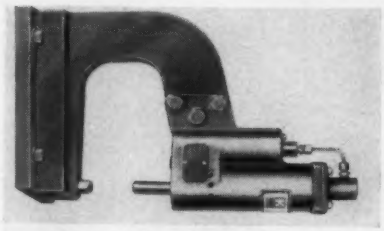
A large automatic honing machine of single-spindle construction, with a two-position fixture which can be loaded or unloaded while one piece is being honed, has been announced by Superior Hone Corp. Designated as model SA, the machine requires but one operator. Automatic air gaging has been built into the honing mandrel, which, after each honing cycle, moves into the bore and gages the part just honed.

All movement of the honing head, fixtures, and air gages is hydraulically controlled and actuated by solenoids. Constant pressure on the stone expansion is maintained by air which also controls rapid expansion and release of the honing stones at the beginning and the end of each honing cycle.

A central control panel, using push-buttons and incorporating signal lights, is located on the front of the machine and, except for loading and unloading, governs the entire operation. A built-in electric timer allows variable cycling.

The spindle is driven by ½-hp three-phase motor, 220/440 v; the hydraulic system by 1-hp three-phase motor; coolant system by a 1/10-hp three-phase Ruthman centrifugal pump. Each machine is built to customer specification.

Superior Hone Corporation, 1607 Elreno St, Elkhart, Ind



Spinner Riveter Redesigned To Give Better Control

Spinner riveter now incorporates adjustment allowing air to be diverted to spinner or hammer for balancing relative speed of spinner and amount of force behind rivet set. This reportedly permits adjustment so rivet heads can be formed without danger of bending, whether run through hollow sections or across open ones.

Keller Tool Div, Gardner-Denver, Grand Haven, Mich

. . . including

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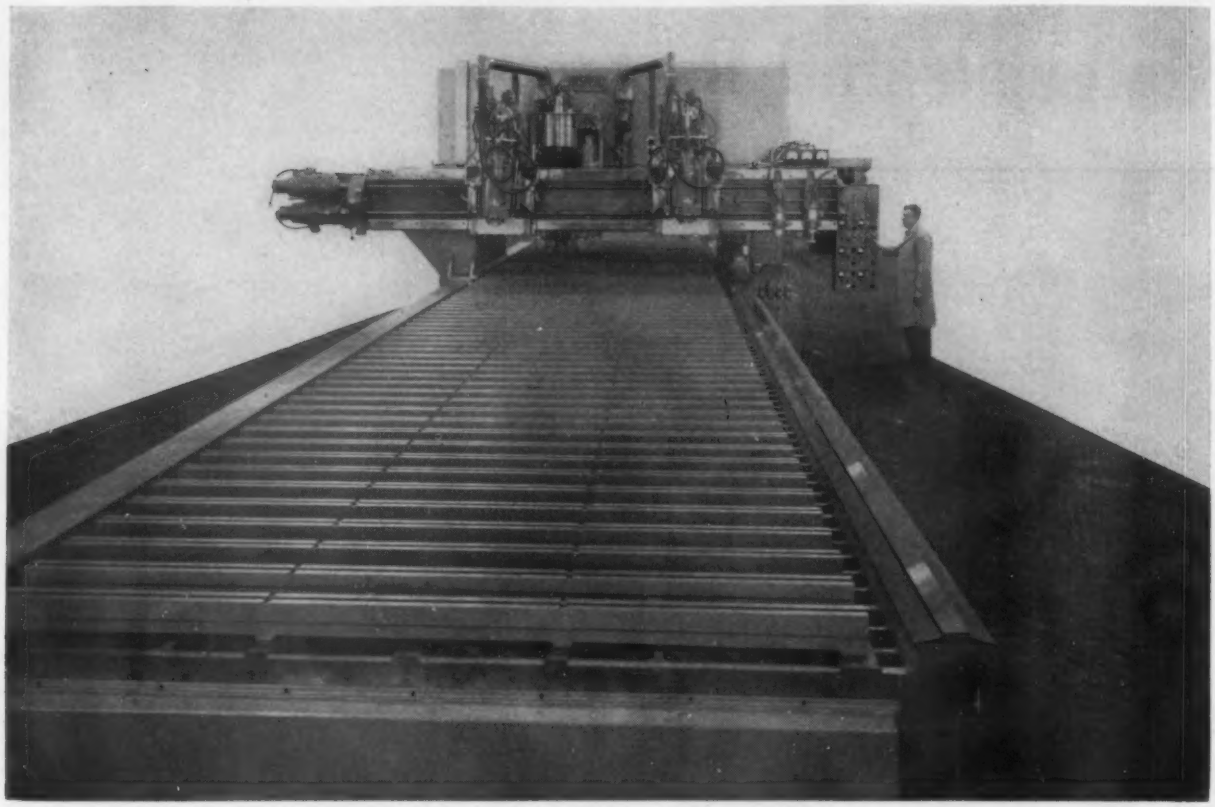
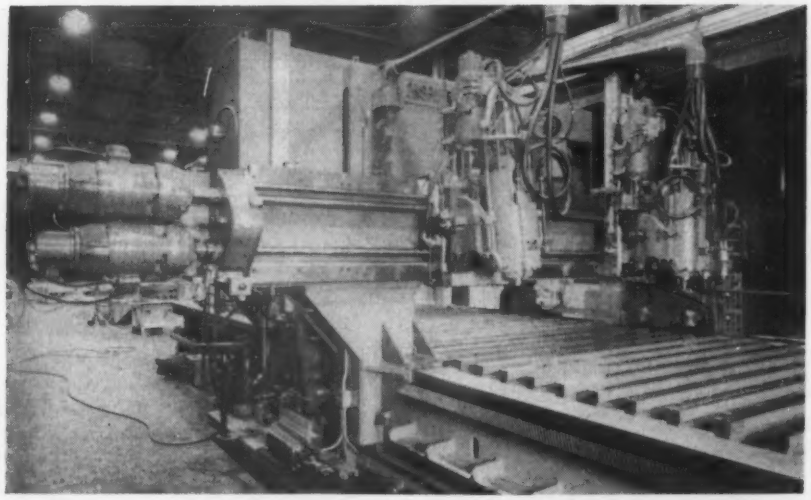


VERSATILE ONSRUD A-72C built for Boeing Aircraft has three heads; primary function is milling aluminum parts to any desired contour. The three heads are capable of taking simultaneous contour, profile, and angular cuts. Design allows additional bed lengths to be added whenever desired. Table and beds are stationary with gantry carriage supporting the two 60-hp cutterheads which pass over the work. With motor units electronically tracer controlled, machine performs accurate work with templets no thicker than ⅛ in.

Onsrud Machine Uses Up To Four Heads Does Skin, Spar, and Profile Milling



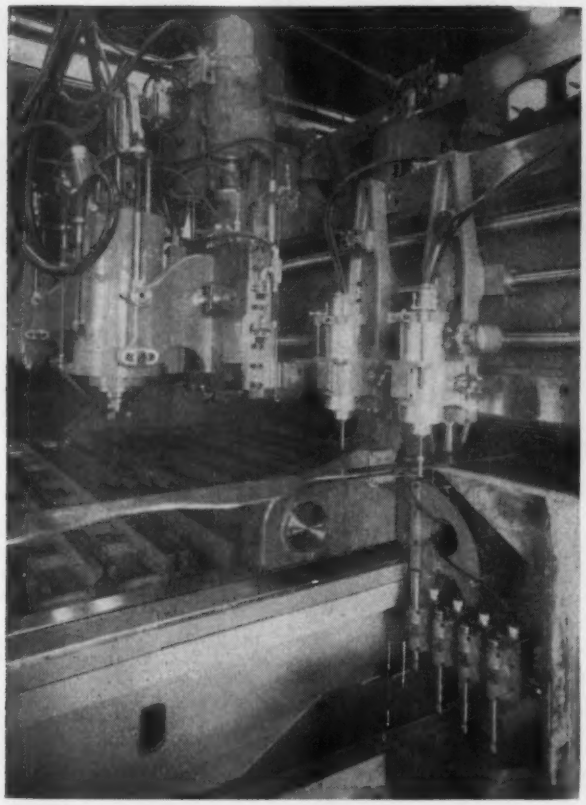
CUTTERHEAD MOTORS are 60-hp liquid-cooled units built integrally in the spindle housings. Each head is electronically tracer-controlled in elevation, angular tilt, and transverse feed motions. Heads may be driven simultaneously or individually, allowing identical jobs to be machined with one set of templets. Cutterheads may be tilted forward or back 10° to allow cutter clearance when milling taper cuts. Note parking area provided for left-hand head which is restricted to 2/3 table width while right-hand head covers entire width

Basic design of the A-72C, conventional with Onsrud, allows use of one, two, three, or four cutterheads. The carriage is powered longitudinally along the bed ways by 5-hp GE Thymotrol drive which provides variably controlled speeds up to 9 fpm, rapid traverse of 18 fpm. Two 60-hp, 3600-rpm, liquid-cooled-motor cutterheads are carried on the gantry-type carriage. The third head of the A-72C is the Invomil—a unit which performs profiling operations using mechanical tracing controlled by joystick.

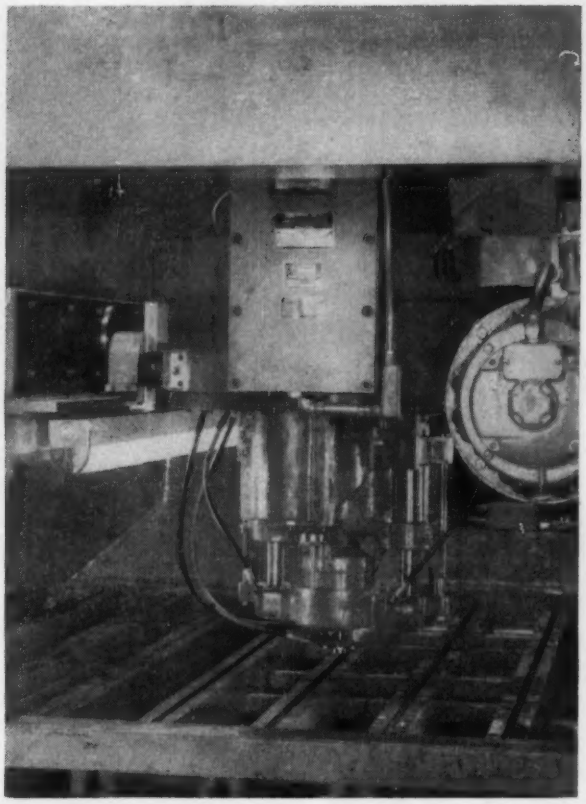
MILLING HEADS

The two heads mounted on the crossrail incorporate the 60-hp motors as an integral part of the spindle housing, the spindle serving as rotor. These motors utilize aluminum water-cooled jackets and all bearing seats are lined with steel retainers.

Each of the main heads has vertical, transverse, and angular motion,



TRACER UNITS of single-dimensional type are mounted on crossrail to control transverse motion. Amplidyne-motor sets (not visible above) are mounted on left of carriage in line with transverse leadscrews. For vertical and angular movements selsyn tracers are used and templets are placed at outer extremity of machine. The two inboard templets control the left-hand head, one for vertical movement and one for angulation. The outer tracers correspondingly control the same motions for the other head. Tilt and elevation drive motors are mounted above and behind each head



THIRD HEAD, the Invomil, is a standard Onsrud unit consisting of a 15/30-hp motor with direct drive to ¾-in.-chuck-capacity spindle. Unit performs profiling operations with three-way feed and pneumatic compensator, enables fast, accurate cuts to be taken on corners as well as in straight line. It uses mechanical tracing, following a templet placed directly on the work. Within the cross-slide rails of the unit there is a rotary turret within which is a pressure-loaded, 30-hp, 60-c motor-driven spindle

using 1-, 1½-, and ½-hp motors respectively. Transverse drive motors are mounted on the left side of the crossrail, driving the leadscrews directly. The others are mounted above and behind each head. All these motor units are completely electronic-tracer controlled. This setup, furnished by GE, includes for each head two selsyn-type single-dimensional tracer systems for controlling elevation and tilt, and a non-selsyn single-dimensional tracer for controlling transverse motion. This latter tracer, not being a remote-control setup (it requires mechanical tie-in with the head so the head can feed back the information that it has followed the orders which were transmitted to it electrically) is mounted on the carriage, tied in with the leadscrew, and uses a stylus which is the same diameter as the cutter. Although both types of tracers use electronic-amplidyne-motor setups, the remote selsyn units can thus be mounted outboard of machine bed.

The amplidyne motor units for the two heads can drive simultaneously or individually. Thus, if two identical parts are being machined, only one set of templets—those for one head—is necessary.

CONTINUOUS MACHINING

The vertical control of the heads can be used only in 4-in. increments, that is, only four inches of movement are available before repositioning is required. This repositioning does not affect the selsyn units. The stylus is realigned to the templet at a reference point and a differential selsyn is turned to achieve correlation between head and templet.

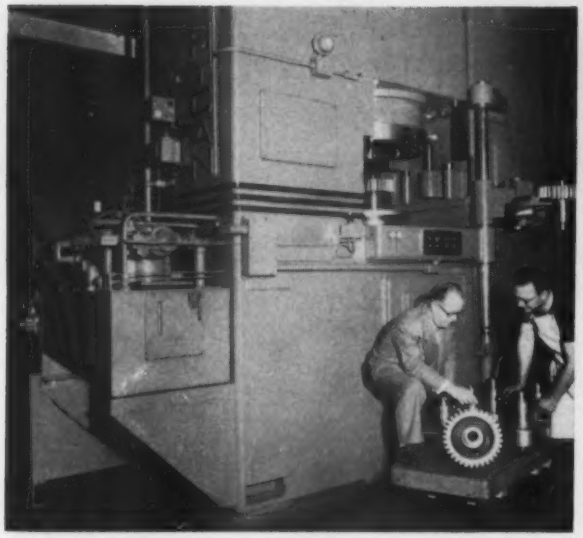
Arranging the selsyn tracers outboard makes it possible to bank seven templets for each tracer, or a total of 28 templets to allow continuous machining.

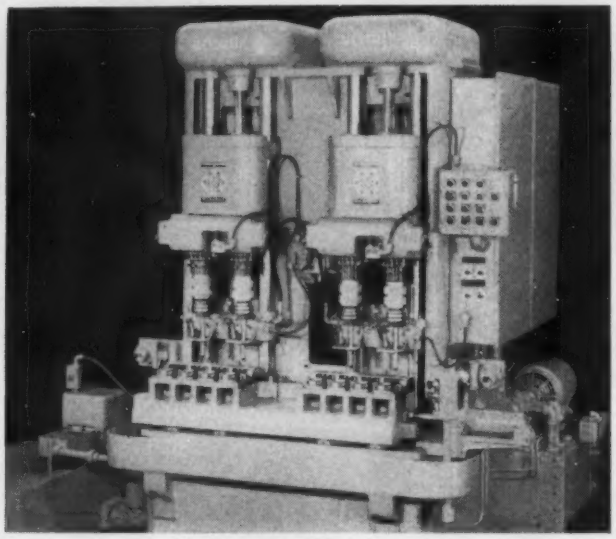
Directly above each 60-hp cutterhead is mounted a pneumatic cylinder which quickly retracts the cutter in the event that over-deflection of the transverse stylus should occur. This cutter unit can be positioned angularly forward and back 10° to allow cutter clearance when milling taper cuts. This setting is manually controlled and preset. Design allows positioning to the outer periphery of the cutter—maximum, 6-in. diameter.

ADDITIONAL SPECIFICATIONS

Distance between centerline of motors (with two motors on crossbeam) is 3 ft; width of table is 9 ft; length of carriage without motors is 9 ft. Maximum height or rail clearance is 18 in.; vertical movement of heads is from 10-in. minimum to 18-in. maximum. Maximum diameter cutter is 14 in. Max transverse speed is 30 ipm; vertical speed, 15 ipm; tilt speed, 10 degrees per minute.

Onsrud Machine Works, Inc, 3900 Palmer St, Chicago 47, Ill





Shear-Speed Produces Gears Up to 20-inch Diameter

What is believed to be the largest, high-production shaping machines developed can handle gears ranging up to 20-in. in diameter and up to 6-in. face width. One model, No. 18206, is over 17-feet high and weighs 44-tons. In operation, this machine reduces shaping time required for a 20-in. dia 3-D.P., 6-in. face-width gear from 3 hours to 13 minutes. Machine cuts all teeth of gear or other external contours simultaneously.

These models make tooling setups, maintenance, and operation a one-man job. Automatic hydraulic positioning hoist, used to swing cutting head into position for mounting, also loads and unloads part blanks weighing several hundred pounds. Of equal importance is the accessibility of the various components. Hydraulic, electrical, and drive components are located so that they are either exposed, or can be exposed in a matter of minutes.

A chip conveyor was built into the machines to carry away the large volume of metal chips removed from a part in one production cycle. Large volume coolant flow is directed not only to keep the cutting tools cool, but also to wash all chips away from the part fixture onto the convevor, as fast as they are produced.

Three automatic pressure lubricating systems feed a continuous flow of oil. One network lubricates all working components of the head. Another keeps the two Cone-Drive gear sets oiled. Third system lubricates moving components of the reciprocating work ram.

Either hydraulic or pneumatic automatic clamping fixtures can be used on the new models. Operation of the clamping fixture is tied into the completely automatic machining cycle. Cutting heads for the Shear-Speeds are readily interchangeable to accommodate different parts sizes and shapes. The stroke of the reciprocating work ram is adjustable to the face widths of the parts being cut.

Other advantages of Shear-Speed shapers include low tooling costs per unit produced and minimum floor space requirements. Complete tool changeovers (cutting head, locating and clamping fixture) can be accomplished in 25 to 45 minutes.

All critical surfaces of each cutting tool are ground to extremely close tolerances. Tools are form-relieved so that sharpening on an ordinary surface grinder maintains the accuracy of the form throughout the life of the tools. Guide areas on the tools and head components are large, thereby practically eliminating any inaccuracies stemming from worn guide surfaces.

Michigan Tool Co, 7171 E McNichols, Detroit, Mich

Synthetic Cutting Compound

Dromus Oil E, made entirely of synthetic ingredients, dissolves in water to yield a cutting solution reported safe and economical, and said to offer several advantages over conventional petroleum-base cutting fluids. First, working solution has exceptional cooling properties. Second, product actually dissolves in water, forming a true solution. Third, Oil E may be mixed with large volume of water to utilize high cooling effect and prevent rusting.

Shell Oil Co, 50 W 50th St, New York 20, NY

Microhoning Machine Increases Production

Developed by Micromatic Hone Corp, the model 710-4 microhoning machine combines two double-spindle machines for increased production, each unit having 10-in.-stroke-capacity reciprocating head assemblies. Each head has individual Microdial automatic stone feed and stonewear compensation plus Microsize automatic sizing control.

Automatic indexing and operator safety are provided by controls which interlock the index table controls with machine controls. Each of the four spindles has two fixtures which are indexed laterally at the end of each Microhoning cycle to alternately align themselves with their respective spindles. This lateral travel permits the operator to unload and reload one group of fixtures while the other four are in Microhoning position.

A producer of automotive parts, using the machine to finish the wrist pin and crank pin bores of a connecting rod, reports simplified processing of the wristpin bore, eliminating three operations with gross production increased to 600 bores per hour.

Micromatic Hone Corporation, 8100 Schoolcraft, Detroit, Mich

Steel Rules

Steel rules, No. 310 chrome-finish flexible and No. 318 chrome-finish tempered, in 6-in. lengths, have decimal graduations in tenths and 50ths. Non-glaring finish is rust and stain-resistant.

Brown & Sharpe Mfg Co, Providence 1, RI

Everything for Dimensional Quality Control

ASSEMBLE THE TYPE OF GAGE YOU NEED
. . . with Rectangular or Square Gage Blocks

The DoALL Micro-Step Gaging System enables you to quickly assemble gages, accurate to millionths, for use *in the toolroom and shop* as well as in the lab or inspection department. This inexpensive system will reduce errors and rejects, and eliminate many costly special gages . . . saving time and money. . .

DoALL

The DoALL Company
Des Plaines, Illinois

turn the page for more details.

Everything for Dimensional Quality Control

DoALL MICRO-STEP GAGING SYSTEM

Here is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

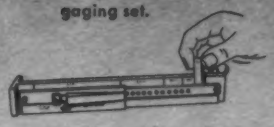
—the means for securing micro-inch accuracy on inside as well as outside measurements.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use in all gaging operations.

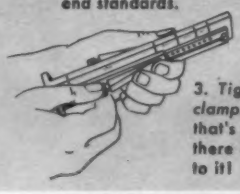
Keys to the system are the new DoALL Gage Holders and End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

Ask for literature on Micro-Step, DoALL rectangular blocks and NEW SQUARE BLOCKS.

1. *Select end standards* from Micro-Step gaging set.



2. *Assemble* — place blocks into channels; snap pins through end standards.



3. *Tighten clamps*— that's all there is to it!

Internal indicating pin gage.

Go and no-go gage.

Height gage with scriber.

Indicating comparator gage.

OPTICAL INSPECTION

Bausch & Lomb Optical Comparators, sold exclusively by DoALL, permit quick visual check of parts to "tenths." Also Toolmaker's Microscope, Stereomicroscopes, Shop and Brinell Microscopes, Contour Measuring Projectors, etc. Ask for Catalog.

With DoALL monolights and optical flats you can "see" millionths of an inch variations in flatness, size and parallelism. Optical flats from 1" to 10".

Charts and fixtures made to order for optical inspection work.

Square and round optical flats.

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DoALL granite surface plates, parallels, flats and V-blocks are of the densest, strongest, least absorptive granite available.

Harder than tool steel; velvet smooth; easily cleaned; accuracy to plus .00005" minus .0000"! The finest available.

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Surface roughness scales, comparators, setting discs, plug and ring gages — to speed inspection and assure accuracy.

DoALL Producto-Chek Comparator with .0001", .00005" and .000010" gaging heads — low cost — extreme accuracy — direct reading — no gears, levers, racks. Ask for Catalog.

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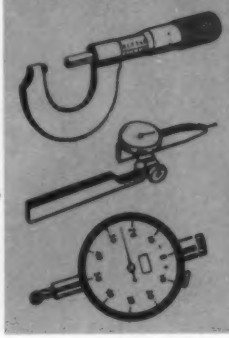
Thread and Cylindrical Plug and Ring Gages

MECHANICAL INSPECTION



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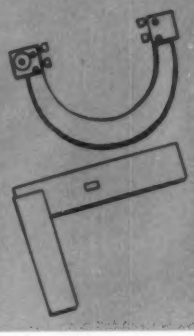

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MACHINES AND ATTACHMENTS

• ABRASIVE-BELT MACHINING — *Engelberg Huller Co, 831 W Fayette St, Syracuse 4, NY.* 28-page catalog contains detailed description of application methods of complete line of units; explains operation of five types of machines. Request direct on company letterhead.

1 PRESS BRAKES & PRESSES—*Dreis & Krump Mfg Co, Chicago 38, Ill.* 4-page circular EPL-366 describes different extended-payment and lease plans available for purchasing or leasing complete line of Chicago press brakes, SS presses, and power bending brakes.

2 AUTOMATION — *Ex-Cell-O Corp, Detroit 32, Mich.* 20-page illustrated brochure 50155 shows typical examples of standard, transfer, and special machines equipped with mechanisms for automatic loading and unloading of work.

3 PRECISION SPINDLES — *Standard Electrical Tool Co, Cincinnati, Ohio.* Catalog 20 covers new line for grinding, boring, drilling, milling, routing, and other kinds of workheads. Contains details on machine-tool attachments, including slides, feeds, traverse, and tables.

4 SCRAP CHOPPER—*Durant Tool Supply Co, Providence, RI.* Illustrated circular describes ram-operated Model M-2; takes up to 6-in. width, up to 0.062 in.

TOOLS AND ACCESSORIES

• "DRILL & REAMER FACTS" — *Whitman & Barnes, Plymouth, Mich.* 36-page fifth edition describes and illustrates design and construction, proper use and care, recommended speeds and feeds, etc. Includes section on carbide tools. Request direct on company letterhead.

5 GRINDING WHEELS — *Simonds Abrasive Co, Philadelphia 37, Pa.* 116-page stock list gives consumer net price per wheel for each ordering quantity for every item listed, as well as wheel size, grain, and grade specifications.

6 MILLING CUTTERS — *Goddard & Goddard Co, Detroit 25, Mich.* 8-page bulletin 121 describes unground multiple-thread units and application. Contains latest tolerances and classifications; maintenance data; inspection procedure for checking cutter rake illustrated.

7 CARBIDE METAL TOOLS—*Allegheny Ludlum Steel Corp, Pittsburgh 22, Pa.* 19-page 8th edition Carmet Methods Manual contains data on increasing tool life and reducing costs. Includes information on applications of new steel cutting grades CA-608 and 610 with superior crater resistance.

8 MACHINE-TOOL LUBRICATION—*Trabon Engineering Corp, Cleveland 3, Ohio.* 4-page bulletin 5410 outlines automatic systems. On-the-job applications and various components illustrated.

9 BRAZING, GRINDING, INSPECTING CARBIDE-TIPPED TOOLS—*Adamas Carbide Corp, Kenilworth NJ.* Illustrated 4-page folder contains step-by-step procedures with tables of specifications and diagrams.

10 GAGE BLOCKS & ACCESSORY SETS—*Freeland Gauge Co, Detroit 27, Mich.* 4-page bulletin illustrates and describes line. Set F-81 consists of 81 special alloy-steel blocks said to produce 240,000 different gages in 0.0001 steps with minimum of 0.200 in. and max beyond 12 in.

11 BALL & ROLLER BEARING LUBRICANT—*New York & New Jersey Lubricant Co, New York 17, NY.* 4-page illustrated bulletin 506 covers F-#925 Non-Fluid Oil, a neutral lubricant unaffected by age, heat, or exposure.

12 PRECISION TOOLS—*Lufkin Rule Co, Saginaw, Mich.* 160-page pocket-size catalog 8 contains illustrated information; applications, charts and reference tables. 160-page Tape & Rule catalog 104 covers complete line; includes miscellaneous section on special rules, gages, squares, etc.

HEAT-TREATING AND WELDING

13 TEMPERATURE-CONTROL SYSTEMS—*Barber-Colman Co, Rockford, Ill.* 8-page bulletin F 6149-2 explains various types ranging from two-position "on-off" to proportional position with automatic reset; terminology, applications, and selection guides included.

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14 STAINLESS STEEL JOINING—*Crucible Steel Co of America, Pittsburgh 30, Pa.* 23-page booklet, "Joining of Crucible Rezistal Stainless Steels," contains detailed description of 17 methods by fusion processes, including manual, automatic, and semi-automatic welding, brazing, and soldering. Eight flame and arc-cutting procedures for severing described.

15 SOFT METAL REVERBERATORY FURNACES — *Eclipse Fuel Engineering Co, Rockford, Ill.* 6-page bulletin C-80 lists sizes, capacities, BTU inputs of dry hearth types, including new hydraulic nose pour unit. Models illustrated with specifications.

PLANT-SERVICE EQUIPMENT

16 MATERIALS HANDLING METHODS—*Barrett-Cravens Co, Northbrook, Ill.* 16-page bulletin 552 illustrates 48 operations with variety of equipment; descriptions of applications cover trucks, elevators, cranes, storage, die-handling equipment, electronic Guide-O-Matic tractor.

● "FINISHES FOR ALCOA ALUMINUM"—*Aluminum Co of America, 768 Alcoa Bldg, Pittsburgh 19, Pa.* 48-page illustrated book describes basic characteristics and applications; outlines methods, including mechanical, chemical, electrochemical finishes, electroplating, and paint, lacquer and enamel. Request direct on company letterhead.

17 OVERHEAD CRANES — *Chicago Tramrail Corp, Chicago 23, Ill.* 20-page catalog T202 illustrates and describes double girder units with top and underrunning trolley in capacities from 2 to 12 tons with spans up to 60 ft; and top running single-girder cranes, both motor driven bridge and hand geared or push type, in capacities from 1 to 10 tons, spans up to 50 ft.

18 CORROSION PREVENTION—*Angier Corp, Framingham, Mass.* 19-page manual on VPI wrap gives detailed explanation of vapor phase inhibitors for ferrous metals and aluminum. Applications illustrated; packaging requirements, protective life expectancy, compositions of various wraps covered.

19 FORK & LIFT TRUCK ATTACHMENTS—*Iron Works Inc, Brooklyn 31, NY.* 11-page illustrated catalog gives specifications and descriptions of clamps, side shifters, scoops, rams, and forks of all types. Covers two new model clamps for handling kegs and drums which can grasp containers for tight stack and approach from any angle.

20 FINISHING—*Du Pont Finishes Division, Wilmington 98, Del.* Two 8-page illustrated bulletins describe dip tank and flowcoat processes. No. 12 discusses size and shape of tanks, methods of dipping, hanging, agitation, tank control. No. 13 includes sections on limitations of flowcoating, operating variables, surface preparation, primers, topcoats, and thinners.

PARTS AND MATERIALS

21 POWDER METALLURGY—*Chrysler Corp, Amplex Div, Detroit 31, Mich.* 52-page illustrated Engineering Manual E-55 contains separate sections on bearings, component parts, and filters. Data on design, loads and speeds, installation, press fit, close-in, shaft clearance, wall thickness, tolerances, temp change, lubrication, machining, hardening, magnetic properties, flow rates. Includes charts, tables, graphs, case histories.

22 AC MOTORS—*General Electric Co, Schenectady 5, NY.* 28-page illustrated catalog GEC-1026 presents complete buying information on standard ac fractional and integral hp motors, including general- and definite-purpose units, and fhp gear motors. Selection data, descriptions, specifications, ratings, book prices, weights, frame numbers, standard modifications included.

23 COLD FINISHED STEEL BARS—*LaSalle Steel Co, Hammond, Ind.* 4-page illustrated bulletin describes Super La-Led, reportedly the fastest machining bar commercially developed to date; nominal rates said to be 80% faster than ordinary screw machine steels. Sections cover speed, efficiency, crimping, roll-threading, chemistry, physical properties, sizes.

● POLY-V DRIVES—*Browning Mfg Co, Maysville, Ky.* 37-page catalog PV-200-A illustrates and describes new drive. Contains specifications on hundreds of sizes of stock sheaves and belts; engineering data for design of drives; tables of drive combinations already worked out for convenient selection. Request direct on company letterhead.

24 LAMINATED PLASTIC—*Continental Diamond Fibre Co, Newark, Del.* 19-page catalog on Dilecto laminate, weighing half as much as aluminum with high mechanical strength. Tables, grades, applications, properties of sheets, tubes, rods included.

25 UNICLOSED MOTOR—*US Electrical Motors Inc, Los Angeles 54, Calif.* 12-page booklet 1856 illustrates improved construction features of Type H, more compact than previous models, but providing more hp per cu in.

26 MEEHANITE CASTINGS — *Meehanite Metal Corp, New Rochelle, NY.* 26x21-in. wall chart lists design and engineering properties of various types, metallurgical facts, and graphs showing effect of mass influence on strength properties.

27 SOLENOID VALVES — *Skinner Chuck Co, Electric Valve Div, New Britain, Conn.* 51-page catalog D1 contains illustrated engineering data on universal, all-purpose 4-way, miniature cutoff, hi-pressure hydraulic, high-flow industrial lines, and special valves. Appendix lists definitions, reference tables, current and flow data.

28 BEARINGS—*McGill Mfg Co, Valparaiso, Ind.* 140-page catalog on complete line contains general engineering data for ball and roller bearings, charts, drawings, and formulae for load computation. Dimensional and load capacity tables for Multirol and Guiderol models included, as well as mounting details, shaft and housing fits, tolerances, applications.

29 CORROSION-RESISTANT CAST ALLOY — *Alloy Casting Institute, Mineola, NY.* 10-page selection guide defines various grades and fields of application. Details on mechanical, physical, and fabricating characteristics.

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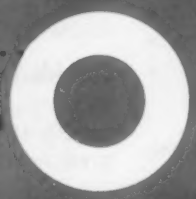
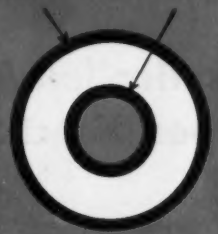


1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this

¾" I.D. x 2¼" O.D.
Weight: 13.5 lbs./ft.

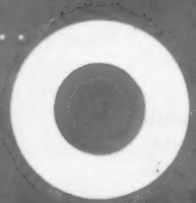
note the scrap loss



4.5 lbs./ft. lost!

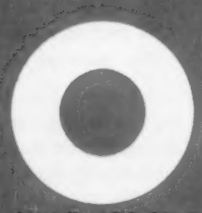
BUT IF YOU BUY ASARCON 773 . . .

to make this



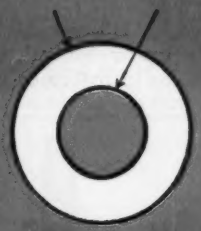
1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this



31/32" I.D. x 2-1/32" O.D.
Weight: 8.7 lbs./ft.

almost no scrap!



Only 0.7 lbs./ft. lost!

Thus far only the SIZE (diameter) of the bronze has been considered. ALSO, with Asarcon 773 you are able to buy exactly the length you need, short or up to 105" long. You get no costly short-ends! More dollars saved . . . no remnants!

In addition, Asarcon 773 (SAE 660) stock bronze has no blow-holes, no pits and no shrinks. The patented continuous casting process by which it is made uses no sand; there are no inclusions in the metal to damage tools. Properties are far superior to those of the similar sand-cast or permanent mold-cast alloys.

Asarcon 773 is available in 216 sizes — tubes and solids — from the stocks of distributors in principal cities. Continuous-Cast Bronze is also made to order in a wide variety of other alloys, in rounds and other shapes . . . up to 20' in length.
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- ☐ Send literature on other Continuous-Cast Bronzes
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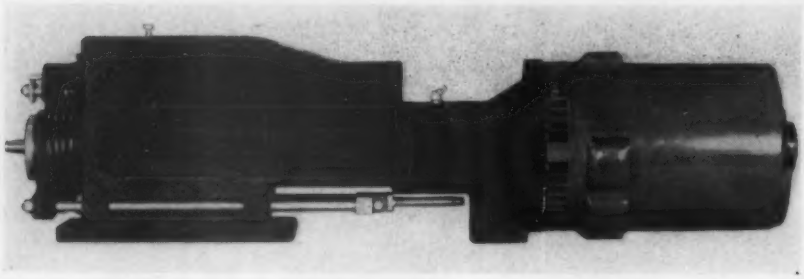
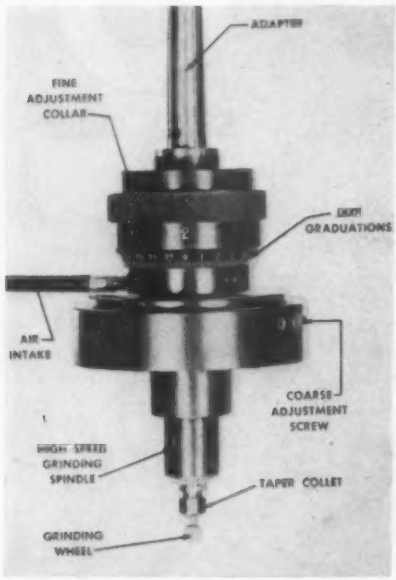


Controlled Air Power Device Does Direct-Spindle Tapping

The Bellows Co has introduced a controlled air power device to do direct-spindle tapping without use of tapping heads or clutches. Basically the unit consists of a Bellows-Locke model 5E drill unit with special in-line mounted GE high-slip 220/440-v, 3-phase motor. Standard shaft speed is 1140 rpm. Unit is furnished with motor control cabinet which includes transformer which delivers 115-v single-phase power for all control circuits.

The setup allows rapid air-power approach to work and hydraulic feed at present rate. Spindle traverse is adjustable from 0 to 3 in. Tap sizes can range up to 5/16-18 or ⅜-24 in mild steel. Unit is capable of continuous duty at rates up to 60 reversals per minute.

The Bellows Co, Akron 9, Ohio



Internal Grinding Head

Air-driven precision grinding head, called Grind-A-Matic, has planetary action and is mounted as a tool in a jig bore, boring mill, lathe, drill-press, or other comparable machine tool. Unit is adaptable to close-tolerance toolroom work on dies and fixtures, and to many production jobs.

Fine adjustment of radial feed can be accurately made without interrupting spindle rotation. Adjustment in increments of 0.0001 through a range of 0.084 in. is aaccomplished by rotating a graduated collar, spring-loaded to eliminate backlash. Coarse adjustment from 0.084 to 1½-in. grinding radius is made with spindle stationary. Thus, with standard equipment, holes from ⅛ to 2½-in.-dia may be ground; with auxiliary mounting arm, range is increased to 4 in.

Two interchangeable spindles are available, one with speeds up to 12,000 rpm, the other to 75,000 rpm. Speed is infinitely variable with both. Adapters or arbors can be furnished for any standard machine spindle and are thread-connected to spindle head.

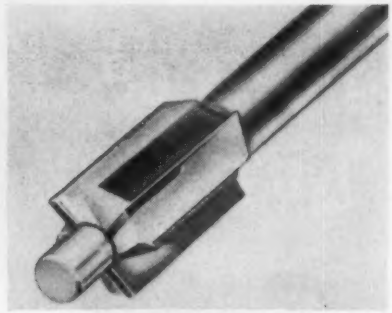
Perfex Gage & Tool Co, 123 Avery St, Mt Clemens, Mich

Double-End Machine Base Simplifies Drill Setup

The M23C-1 double-end machine base was designed to simplify the building of automation type of special machines for drilling or tapping opposed holes. Special tooling setups incorporate two Holomatic drill units with standard hand or air-operated clamps, index tables, shuttle tables, trunnion fixtures, or multiple spindle heads can be adapted to base. Parts with holes from ½ to 24 in. apart can be machined.

The cast semi-steel top is 12 in. wide, 60 in. long, and 4 in. thick and has a precision ground top. A 1-in. key way runs full length of top. Two sets of four leveling assemblies are incorporated. Large accessible area is provided for chip collection, bottom tapering to screened outlet.

Hause Engineering, 809 S Pleasant St, Montpelier, Ohio

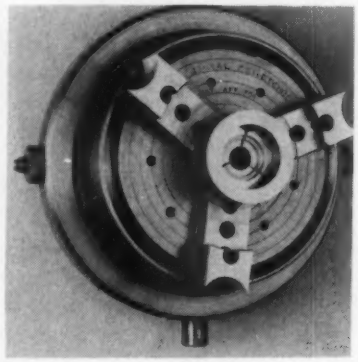


Carbide-Tipped Counterbore

Nelco Tool has introduced Series 600 carbide-tipped counterbores for drill-press operation on non-ferrous metals.

Tip ends less than 0.015 in. from pilot hole, allowing use of pilots only 1/32 in. larger than the hole. This eliminates the problem of leaving a shoulder around the hole in the work, and reportedly assures an accurate, clean cut to exceptionally close tolerances. Hole running completely through the tool facilitates removal of pilot. Special grade of carbide is available for use on steel.

Nelco Tool Co, Manchester, Conn



Production Collet Chuck

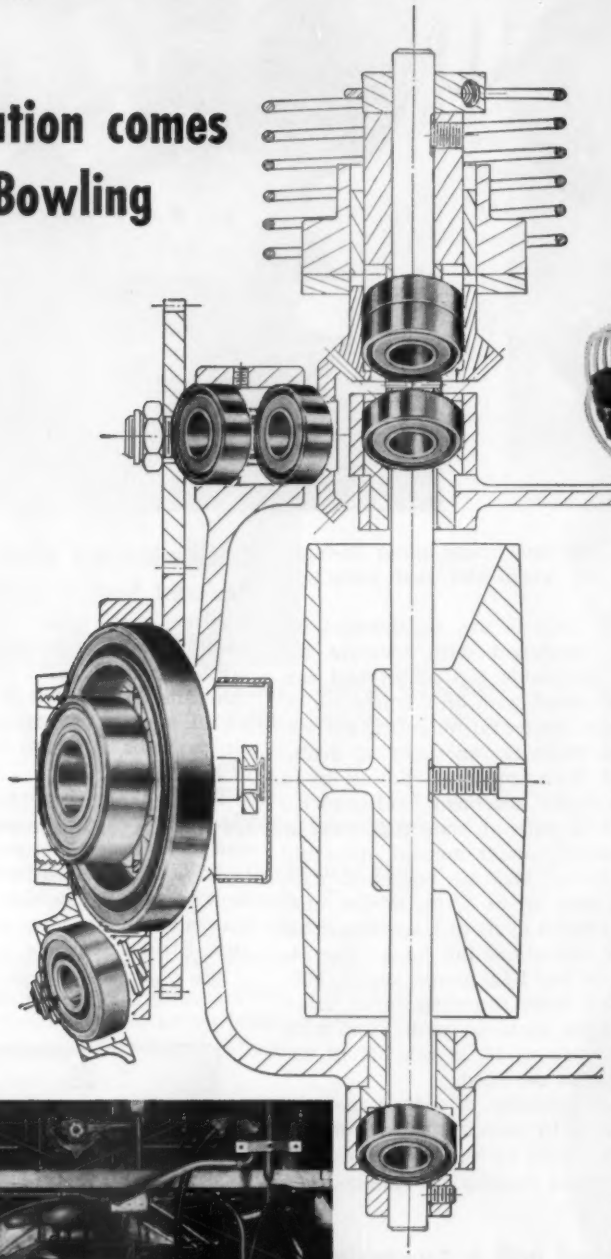
The Johnal production Coll-et-Chuck was designed to incorporate the best features of the conventional collet closer, OD chuck, and ID chuck into one universal tool. When used as collet closer, chuck is designed to accommodate Hardinge Type 5C collet to 1- in. capacity. Collets are closed radially, eliminating tendency of work to creep. Chuck is reported accurate within 0.0005 in. FIR. Collet chuck is intended for use as an OD chuck when odd-sized work is encountered. Symmetric soft jaws supplied with chuck are readily machined to suit the particular job. Chuck has provision for adjusting chuck body concentricity with respect to lathe spindle to allow compensation in event that it is used with worn collet.

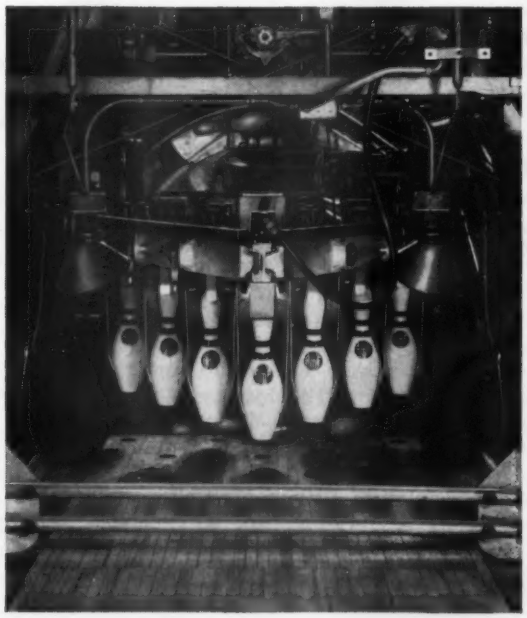
Milman Engineering Co, 957 Lillian Way, Hollywood, Calif

Turning Points to more Efficient "Pin Boys"!

Automation comes to Bowling

Section of Pin Distributor Drive Head Assembly equipped with six Fafnir Extra Small Series Double-Shielded Ball Bearings including a duplex arrangement plus a 200 Series Plya-Seal Bearing located in housing within an Aircraft Type Bearing . . . also another 200 Series Bearing with Plya-Seals.





AMF Automatic Pinspotter is shown in process of lowering pins.

Watch an American Machine & Foundry Company Pinspotter in operation sometime, and you'll agree that it's an outstanding example of automation. This ingenious machine performs a multiplicity of complicated operations with amazing smoothness and dependability.

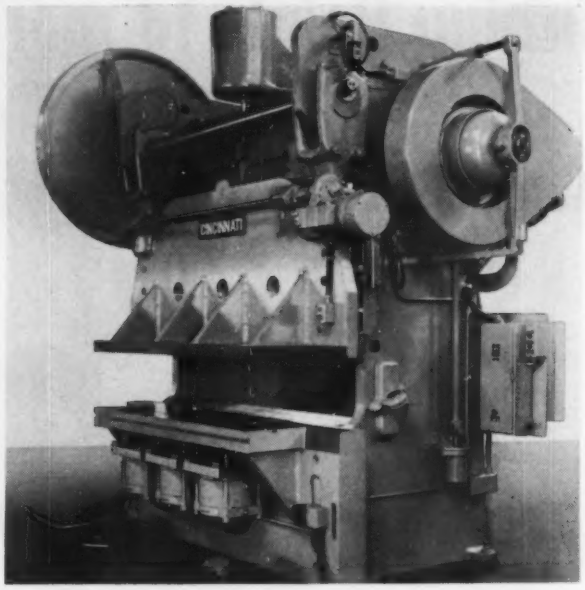
Incorporated in many of the turning points of the Automatic Pinspotter are Fafnir Ball Bearings . . . forty of them in all. They include several sizes of the 200 Series, Inch Type, and Extra Small Series, all with double grease shields . . . also three different Aircraft Type Ball Bearings with double Plya-Seals and a Flangette. Effectively placed, these ball bearings permit precise coordination of motion unhampered by friction.

Here is another example of the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the designer's viewpoint, plus coming up with the right bearing to fit the need. Automation problems and solutions are part of Fafnir's industry-wide experience. If you need the advantages of such experience, let Fafnir help you. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR

BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

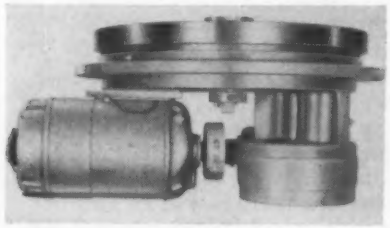


Diebel Automatic Press Permits Accurate Alignment

This 100-ton double-crank welded steel press is built with 40, 50, and 60 in. between uprights and 32 in. front to back. Speed range is from 80 to 240 spm.

Exclusive cylindrical-type ram is reported to provide accurate alignment while air-clamped feeds prevent stock distortion and permit positive feeding. Press is available with single or double feeds and scrapcutter. Standard equipment includes balanced crankshaft, air counterbalances, automatic metered lubrication system, completely wired electrical control system, air clutch, and specially designed shock mounts.

Di Machine Corporation, 2701 W Irving Park Road, Chicago 18, Ill



Powered Index Tables

Automatic units available in 21 and 34-in. table diameters with 6, 8, or 12 stations are operated by a Geneva drive using a needle-bearing cam follower operating in ways faced with hardened and ground tool steel wearing plates.

Hardened and ground tool steel lock pin, actuated by a cam plate, enters the ways before cam follower leaves them, eliminating possibility of out-of-time or mis-index. Table is driven by a 220-440-v, 3-phase, 60-c, 1800-rpm brake motor through a bronze worm and gear reduction unit.

Both models are furnished with tables equipped with locators for interchangeable top plates and can be furnished with an adapter which permits horizontal mounting for use as the drive for an indexing drum.

The 21-in. model is driven by a ¾-hp motor and has a load capacity of 400 lb with an indexing cycle of 1.5 seconds under normal operating conditions. May be equipped with top plates up to 32 in. in dia, and, with a work cycle of 3 sec is capable of 800 operations per hour. The 34-in. table has 1-hp motor; carries 800-lb load; 2-sec indexing cycle; takes top plates up to 48-in.-dia; and with 4-sec work cycle, is capable of 600 operations per hour.

Load capacity of either may be increased by increasing indexing cycle in direct ratio.

Cleveland Tapping Machine Co, Canton, Ohio

Combined Drill & Countersink

Units with spiral flutes furnished at regular prices in plain type; sizes 1 to 18 carbon and in high speed; bell type, sizes 11 to 18 in high-speed only.

Angle of countersink is 60° included angle on all regular or plain and bell type countersinks; on bell type countersinks, angle of bell is 120°. Diameter of drill sizes range from 3/64 through 1/4 in. and length of drill portion equals that of the drill diameter. Plain type is available in 5-piece sets, in carbon or high-speed.

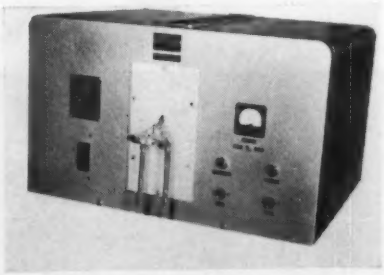
Chicago Latrobe, 411 W Ontario St, Chicago 10, Ill

Cincinnati Press Brake Performs Shallow Draw

All-steel press brake, used for shallow-draw work and various types of press operation, has a 36-in. bed and ram with shut height of 15 in., overall die surface of 8 ft, and six 12-in. air cushions mounted on underside of bed.

The brake is equipped with air-electric clutch having automatic stop and non-repeat features. Two foot pedals operate simultaneously or independently. Special two-speed transmission operates at 13 and 30 spm. Stroke of brake is 5 in.

The Cincinnati Shaper Co, Hopple, Garrard & Elam St, Cincinnati 25, Ohio



Induction Heating Unit

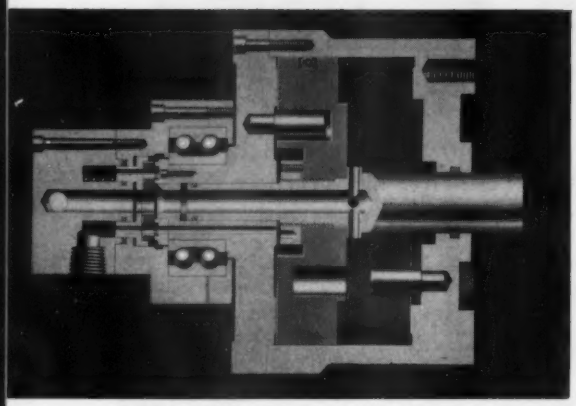
The model IH-3 induction heating unit has NEMA rated output of 3 kw, offers selective dial setting and recycling by automatic timer. Power output is variable and output transformer makes possible low voltage in output coil.

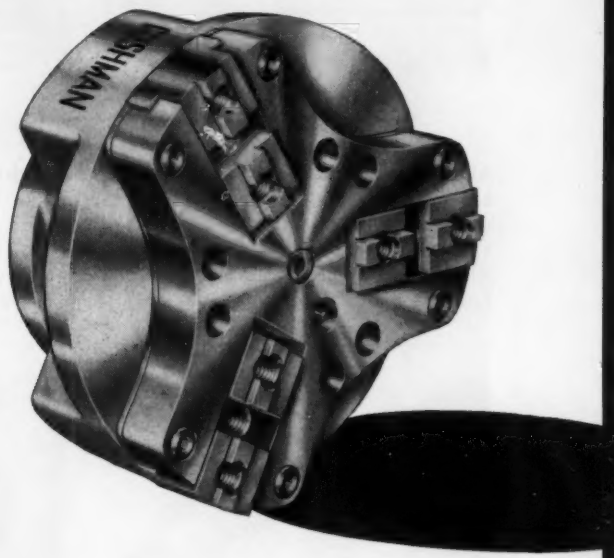
Industron heating units feature single turn coil which accommodates complex shapes. Multiple turn coils are also available. The cabinet is of hammertone steel.

Industron Corp, 50 Brook Rd, Need-Ham Heights, Mass

CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY: The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . .through design and selection of the right work-holding devices.





Typical Cushman Air Operated Chucks and Cylinders for repetitive machining operations permitting increased production at lower costs.

the key to machining efficiency

Today's repetitive manufacturing demands *efficient* and *economical* operation of high speed machine tools. Cushman Air Operated Chucks and Cylinders give you **Chuck-ability** with satisfactory performance under the punishment of constant day-in and day-out service . . . no loss of chuck or cylinder efficiency over a long service life . . . no air leakage problems . . . and the feature of *quick* loading and unloading of workpieces at the touch of foot or hand.

Chuck-ability is available to you in Cushman's complete line of manually and air operated precision chucks, designed and manufactured to meet today's high metal working quotas at lower production costs.

Write today for catalogs fully describing Cushman Chucks. Or, should you have a particular work-holding problem, Cushman can give you **Chuck-ability** in a special chuck, designed and engineered to your requirements.

THE CUSHMAN CHUCK COMPANY • **Hartford 2, Connecticut**

a world standard for precision

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1867

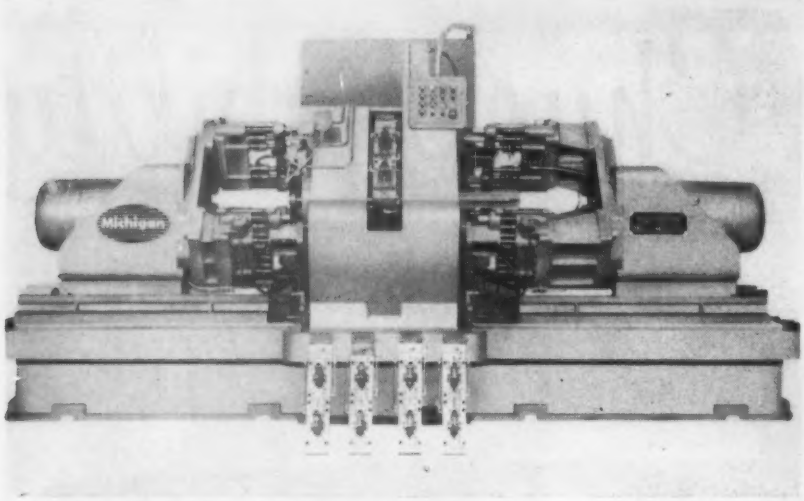
CUSHMAN CHUCKS . . . A Product of American Quality, Labor and Materials.

SEE YOUR INDUSTRIAL DISTRIBUTOR

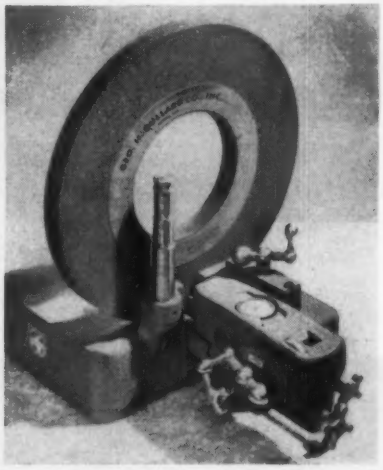
manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

3C855



AUTOMOBILE DOOR HINGES have pin holes drilled and reamed on this double-end hydraulic-feed machine—a four-place, four-station unit with power-operated, trunnion-type fixtures. Setup is interchangeable to handle any size hinge. Drilling and reaming heads are pot type, equipped with ball bearings. All electrical and hydraulic installations conform to JIC standards. Machine handles 1800 hinges per hour—*Michigan Drill Head Co, Box 4643, Detroit 34, Mich*



Instrument Measures Dynamic Hardness and Lubricity

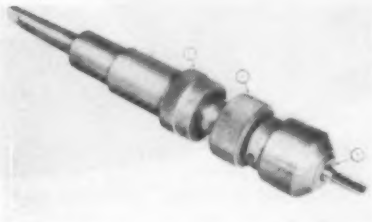
The Dyhedron tester determines the dynamic hardness and natural lubricity of materials—properties related to ability to resist being marked, gouged, or scored. The tester has a shaped diamond penetrator which rotates 360° in one direction, followed by similar motion in opposite direction.

This motion is accompanied by 36° angular progression causing penetrator to change its stopping position each cycle.

A direct-geared revolution counter maintains accurate count of each rotary oscillation. The mechanism contained in the testing head provides constant spring pressure of penetrator against workpiece, and a dial micrometer for accurately indicating the depth of penetration in thousandths of an inch.

Model 164-C is for ceramics, 164-M for metals.

Taber Instrument Corp, Section 102, 111 Goundry St, North Tonawanda, NY

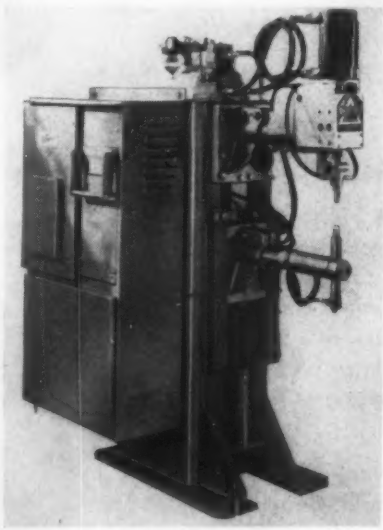


Maxwell Combination Tool Takes Recessing and Boring Cuts

The Maxwell combination recessing and boring tool works this way: pilot is entered into work until it comes into contact with anti-friction stop (1) on nose of tool. As toolholder continues to feed toward work, body assembly moves forward until adjustable stop nut (2) controlling diameter of recess comes into contact with boring unit retaining ring (3). This causes eccentric cutter to rotate, producing recess cut of required diameter. When dia is reached, more powerful spring in boring unit compresses, allowing cutting edge to move forward to complete boring operation. Diameter of bore cut is regulated by stops on feed mechanism of equipment being used.

Cutter is designed so boring operation is performed by chamfer or form ground into front end. A second cutting edge is provided so bore travel is held to minimum. On completion of bore cut, tool is retracted and shaving cut is performed on return stroke.

The Maxwell Co, Dept 2G, 250 Broadway, Bedford, Ohio



Resistance Welder Handles Medium-Gage Sheet Metals

High-production, heavy-duty spot welder is equipped with air cylinder of sufficient capacity to handle wide range of metal thickness. Lower arm is adjustable vertically from 13 in. between the arms to 23 in. in open position. Head has hardened and ground lubricated slide riding in adjustable V gibs.

Lower arm is adjustable in horizontal plane from standard throat depth of 18 in. to within 9 in. of machine face. The welder has a fabricated steel frame of formed boiler plate. Unit lists at $1450.

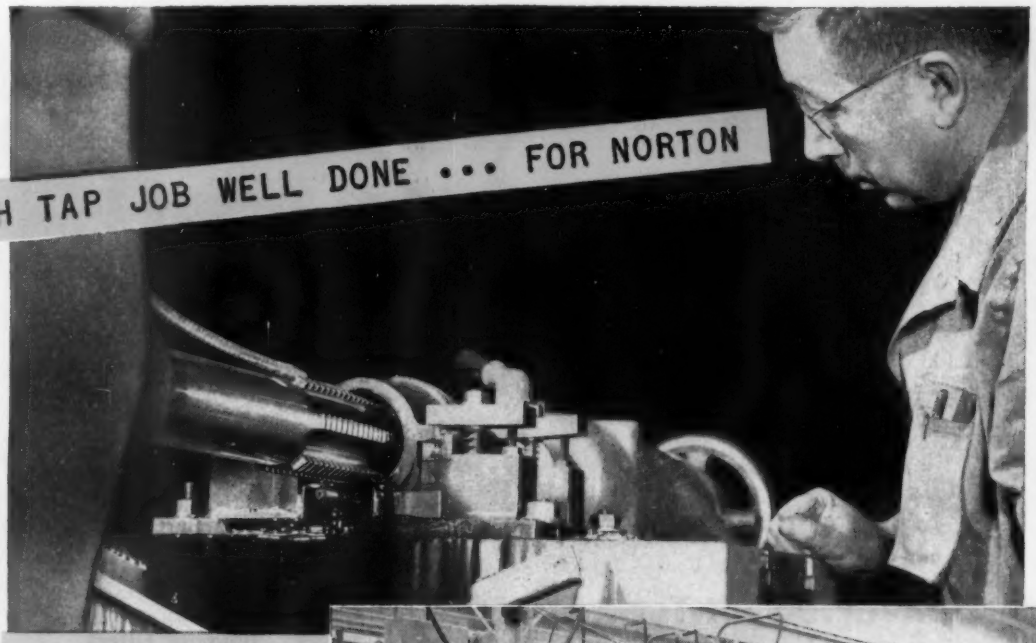
Delta Welder Corporation, 8525 Livernois, Detroit 4, Mich

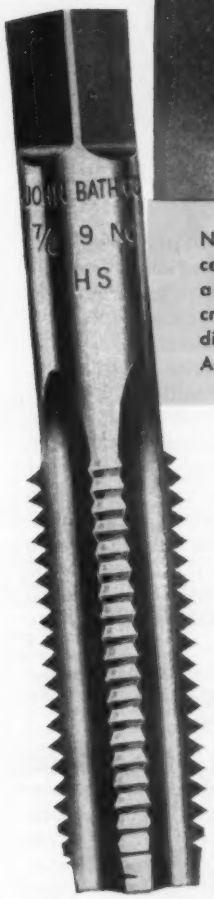
Tapping and Drilling Head

Universal-joint adjustable tapping and drilling head can be changed over from one function to the other in less than ½ minute. It is adjustable to any pattern of holes and available with 4 or 6 spindles. Heads are made of best grade sand-cast aluminum with hardened and ground gears and spindles. There are full-grooved ball thrust bearings and Oilite bronze radial bearings. Unit features positive clutch drive and reverse.

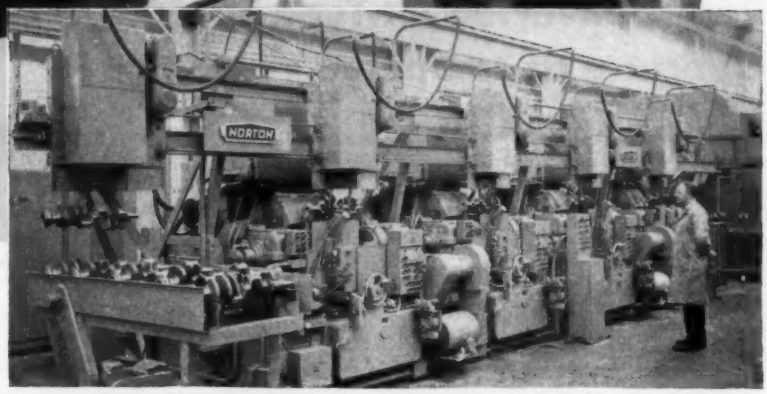
No. 0 has 0 to ¼-in. tap capacity, min distance between centers of 11/16 in. and max pattern of 5¼ in. The No. 1 has tap capacity of 7/32 to ½ in. and min center distance of 1½ in. with max pattern of 8 in.

Errington Mechanical Laboratory, Inc, Staten Island 4, NY





Norton operator at Worcester, Mass. plant, threads a full nut for automatic crankpin grinder with 3½" diameter, 2½ pitch Bath Acme tap.



Precision

. . . a basic ingredient of Automation

This new Norton Transfer Type Crankpin Grinder is the first fully automatic machine for this difficult operation and was recently installed in the new V8 engine plant of Studebaker Packard Corp. at Utica, Mich.

These automatic operations . . . locating, grinding, gaging and transferring, require one basic work ingredient . . . PRECISION.

Extreme accuracy of components includes threading and gaging the parts that move heavy wheel heads to produce crankpin diameters to close tolerance.

Selection of Bath taps and gages by Norton to do this work, is tangible proof of the Bath Line reputation for dependable accuracy and economical performance.

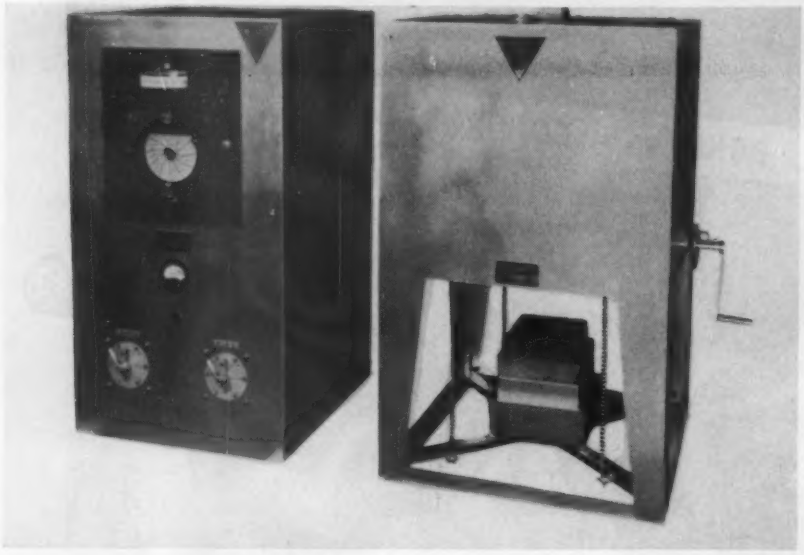
When you build any type of machinery . . . be sure to remember that accuracy starts with the production of component parts. When it comes to threading and gaging . . . industrial leaders rely on Bath taps and gages for the all-important work ingredient . . . PRECISION.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

22 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS



Pereco Inverted Pit-Type Furnace Operates at Temperature of 2900 F

New Pereco inverted pit-type furnace operates at maximum temperature of 2900 F, has a work chamber 9x9x10 in. The fully insulated plug-type door is raised and lowered by manually operated lift chain positioned in vertical guides. Case is made of 12-gage steel.

Silicon carbide heating elements are positioned four on each side of chamber. Power controls include 15-kva, 230-v, voltage-regulating transformer with fine and coarse tap switches, input ammeter, and magnetic contactor. Temperature control (program or other type) can be provided to meet individual needs of purchaser.

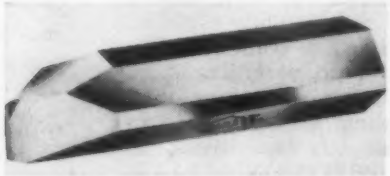
Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio

Extra Finishing Tooth On Inserted-Blade Face Mills

Increased feed rates used with Millit inserted-blade face mills have led to use of extra finishing tooth on many cutters. Finishing tooth is ground flat with ¾° lead angle at both ends. Length of flat must exceed feed per rev. Being ground 0.004 in. higher than outside roughing teeth, it takes finish chip 0.004 in. deep, removing revolution marks left by outside roughing teeth.

Cutter illustrated is 8-in.-dia face mill with 30 solid carbide ¼ x ⅜ x 1½-in. rectangular roughing blades. Finishing tooth uses same blade size rotated 90°. Particular cutter is used to mill head castings on air compressors where surface finish is of prime importance. It is run at 400 sfm, 63 ipm, and will do 1000 large castings per grind. Higher feed rates are made possible by closer blade spacing and exceptionally high blade strength characteristics of cutter.

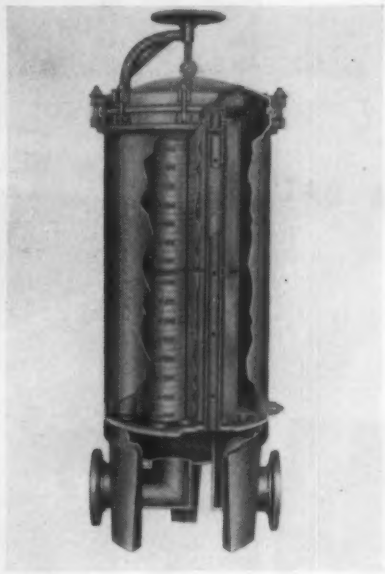
Millit, Inc, 37 Flint St, Rochester 8, NY



Diamond-Holding Alloy

Diamond-holding formula named m-28, combined with exclusive setting process, is said to guard against diamond loss under most difficult operating conditions. Coldset reports that form tool users engaged in jet bucket blade grinding have found the tools especially valuable. They guarantee replacement of any new shape tool should failure of setting occur.

American Coldset Corp, 87 Court St, Paterson, NJ



900-gpm Filters

Honan-Crane line of Full Flow filters can be used for a variety of liquids including engine lube and fuel oils, metalworking oils and coolants, and parts washing solutions.

Designed for inline installation, compact units are said to have exceptionally high flow capacity to insure continuous filtration of entire oil or coolant supply. Nine different sizes are available, using one to 36 cartridges. Flow rates range from 25 to 900 gpm; pressure drop across unit is 4 psi on oil of 170 sus operating viscosity. Extra-large dirt-holding capacity is obtained by Flo-Pac cartridge.

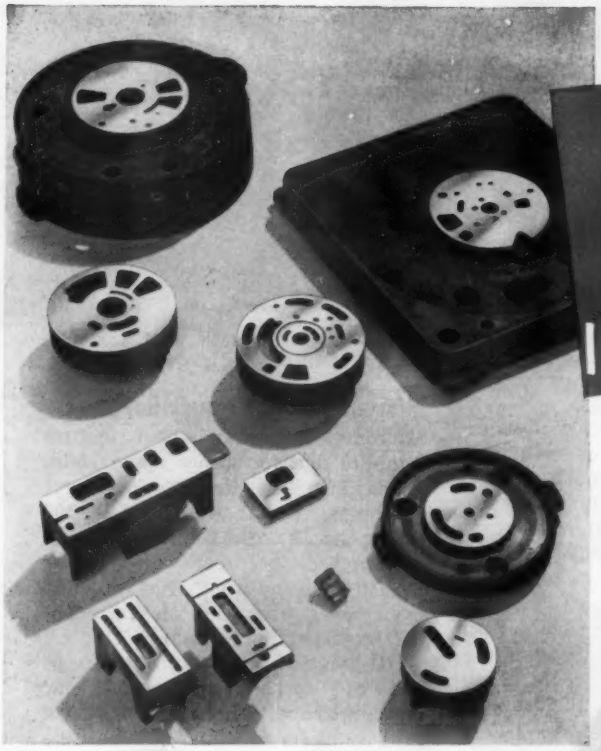
Filtration Division, Houdaille-Hershey of Indiana, Inc, 904 Sixth St, Lebanon, Ind

Rubber - modified styrene sheet, Campco S-540, is said to have improved impact strength, fine texture, and exceptional freedom from strains. Available in range of thicknesses and colors; thinner gages from 0.010 to 0.030 in. in widths up to 26 in.; heavier gages from 0.040 to 0.187 in. in widths up to 40 in.

Campco Div, Chicago Molded Product Corp, 2717 N Normandy Ave, Chicago 35, Ill

Dresser cutter, designated "Wise Type," has slim, finger-like points which pick abrasive grain from surfaces of grinding disks instead of crushing the grain and rolling it off, as do conventional broad tooth cutters. This action reportedly sharpens the disk without changing its grinding characteristics. Square arbor holds cutters firmly in place with teeth in staggered position.

Besly-Welles Corp, Beloit, Wis



Get Precision Flatness, Finish and Parallelity on Valve Parts Like These . . . In Production Quantities With a

Lapmaster®

Air brake valve parts like these are being production lapped on JOHN CRANE Lapmasters every day at a tremendous savings in time and money. For instance, one of the rotary valve seats shown here formerly required over two hours of lapping time to pass the "no leak" bubble test — time has now been cut to ten minutes on the Lapmaster.

This is the machine for you if you are looking for precision flatness and finish in quantity on all forms of ferrous and non-ferrous metal, ceramics, plastics or crystals. Lapmasters readily lap to the extremely close tolerance of one light band (.000011") or less. They also produce a fine finish to as low as 1 RMS.

You are invited to send us a few sample parts including surface finish specifications and approximate production requirements. Our lapping laboratory will then be in a position to provide you with complete facts on the application of the Lapmaster to your work. There is no obligation.

Crane Packing Co., 1836 Cuyler Ave., Chicago 13, Ill.
In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont., Canada

Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Spent mixture drains off through serrations in lap plate
Conditioning rings serve as standard workholder
Conditioning rings keep lap plate flat automatically

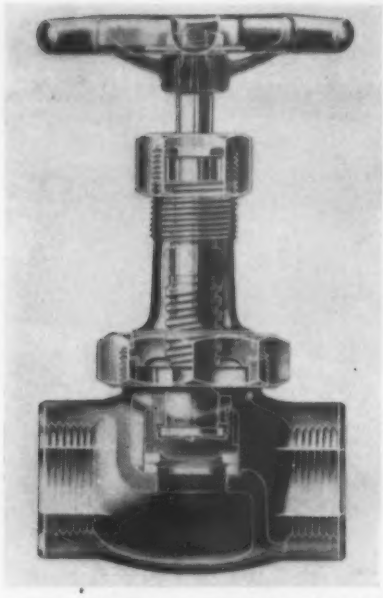
*Protected by United States and Foreign Patents.

FREE TECHNICAL DATA
on the Lapmaster is available on request, also information on measuring flatness. Write for your copies today.

Lapmaster® DIVISION

CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

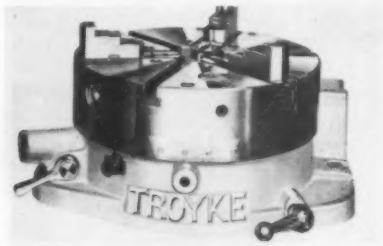


New Design Bronze Globe Valve Announced by Lunkenheimer

The LQ600 bronze globe valve was announced by Lunkenheimer following a four-year testing program. Two new elements are involved. The seating metal is Brinalloy with high wear- and corrosion-resistance. Second is the flat-seat design of the valve. The Brinalloy seats and disks do not require replacement, renewing, or regrinding.

The valve has the Stemalloy stem and is operated by non-slip handwheel. Other features include: high-strength bronze in body and bonnet; and true back-seating.

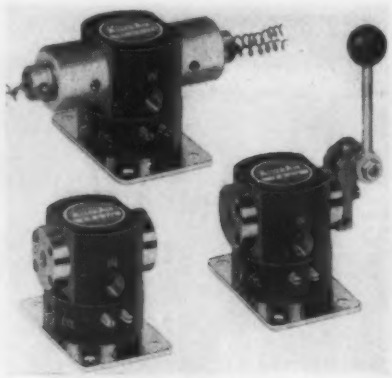
The Lunkenheimer Co, Box 360, Cincinnati 14, Ohio



Troyke Roto-Indexer

New Troyke Roto-Indexer is said to have unique block-out arrangement in which any or all stations of hardened and ground 20-station index plate can be blocked out with use of screwdriver. The plunger is hardened and ground. Rigid-locking center bearing is adjustable for wear. Support of table is achieved by two oil-grooved bearing surfaces. Unit is graduated in degrees and can be used in vertical or horizontal position.

Troyke Mfg Co, 4422 Appleton St, Cincinnati 9, Ohio

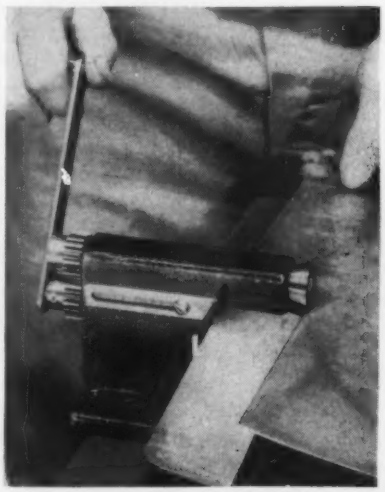


Air Control Valves

Air control valves in 24 models are available with ¼-, ⅜-, or ½-in. ports for operation from 5 to 150 psi. Key models are double-solenoid type, air bleed, air pilot, and hand valve.

Solenoid and air bleed models are of momentary contact type. Others have double actuation or spring return. All valves have two built-in speed controls and all friction surfaces are hardened and permanently coated with baked-on lubricant.

The A K Allen Co, 57 Meserole Ave, Brooklyn 22, NY



Small Rotary Shear

The hand-operated Toolmaster rotary shear provides sufficient mechanical advantage to cut steel, other than stainless, as heavy as 16 gage without undue effort. Other advantages claimed are: cleaner, straighter cut; positive adjustment for width of cut from 2 in. maximum down to trim as fine as 0.005 in.; and unit can be bolted to bench or truck.

Body of tool is iron casting with bolt hole in each foot, plus two bolt holes in flange. Crank, throat guides, and precision cut gears are steel, and replaceable wheels are high carbon tool steel.

Fidelity Tool Supply, Inc, 309 Vine St, Camden 2, NJ

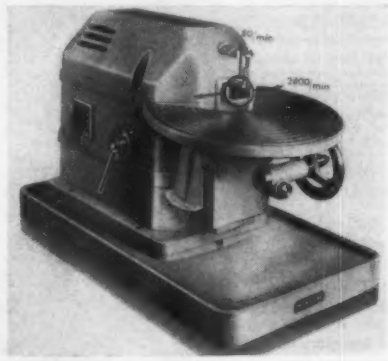
Micrometer-Dial Handwheels

Micrometer-dial handwheels feature 3-in.-dia dial for lathes up to 12-in. swing; also 4-in.-dia dials for larger machines. A dial graduated in 100 spaces has 3/32-in.-wide spaces. It is reported that work in "tenths" is easily accomplished. Dial is visible even when cross-slide is retracted for largest diameter work.

All wheels and dials are made of good quality steel with groove near circumference to hold special turret lathe clips for all types of repetitive work.

Handwheels are installed by replacing present handwheel or handle —index marker fits on extension bearing for cross-slide screw ahead of present micrometer dial. It may be necessary on some lathes to turn bearing. End of shaft and nut are recessed into handwheel to avoid cutting hand.

Strine Machine Shop, 111 West Walnut St, Cardington, Ohio



Carbide Lapping Machine

Super-finishing machine for carbide tools is reported to enable users of carbide tools to obtain 50% longer cutting life over conventional diamond wheel finished tools. An inexpensive diamond hone is used instead of normal 6-in. diamond wheel. The hone laps the cutting edge of the tool with a reciprocating movement in four directions in a vertical plane.

Wickman Manufacturing Co, 10325 Capital Ave, Oak Park, Detroit 37, Mich

SQUARE D *Reduced Voltage* STARTERS

One of these 4 types will meet your requirements . . . best

- Is minimum motor current inrush your primary consideration?
- Is it reduced starting torque?
- Or maximum smoothness in acceleration?
- Is cost an important factor?

With these four types Square D can meet any reduced voltage starter requirement—exactly.

Write **for Reduced Voltage Starter Bulletins. They give complete details.**
Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

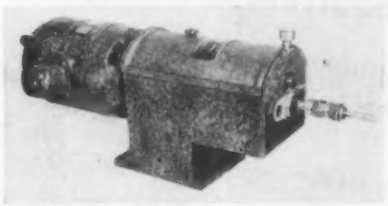
SQUARE D COMPANY

Heat-Treating Furnace Uses Protective Gas Atmosphere

Cooley announces a new general-purpose heat-treating furnace designed to use a patented protective atmosphere for general hardening of tool steels, and carburizing. According to the manufacturer, steel hardening in this equipment is clean and free from decarburization.

Atmosphere system consists of cracking unit to which is fed, by variable speed pump, a mixture of alcohol and water proportioned according to treatment desired. Mixture is cracked into gas of a controlled analysis to maintain the correct carbon potential for equilibrium with steel being treated. To insure complete seal, furnace is equipped with an Inconel retort with welded thermocouple well and welded pipe extension to provide for gas admission. Chamber dimensions are 8x6x14 in.; power rating is 4.8 kw at 230 volts. Door is controlled by treadle.

Cooley Electric Mfg Corp, Dept A-2, 38 Shelby St, Indianapolis 7, Ind



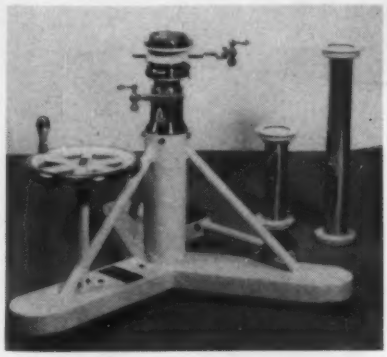
Leadscrew Tapping Unit Is Electrically Operated

The ATU No. 3 leadscrew tapping unit is a self-contained, electrically operated and controlled unit, designed for fast single and multiple spindle tapping and threading. The unit needs no reversing motor.

Built-in rheostat control permits clutch torque to be regulated over equivalent range from 0 to 2 hp. Clutches are energized within themselves—there is no end pressure on either leadscrew or taps. Depth control knob allows tap depth to be set within ¼ turn anywhere within maximum stroke of 1⅞ in.

The unit can be operated in any position. Hardened and ground leadscrew runs in bronze split lead nut. Wide choice of motor drives is available.

Ettco Tool Co, Inc, 59½ Johnson Ave, Brooklyn 37, NY



Master Stand

The Servo master stand was designed to permit faster and more accurate setups of jigs and fixtures, machinery alignment, and general tooling. It provides industrial users of transits, levels, and jig collimaters with a precision instrument stand of maximum safety, stability, and convenience. Features include: vertical micro-feed adjustment; lateral adjuster rotating through 360°; heavy base with low center of gravity; easy portability; and maximum rigidity.

Two models are available: 1004 for 24 to 64-in. height ranges; 1001 for 51 to 82-in. height ranges.

Surveyor's Service Co, 2021 South Grand Ave, Los Angeles 7, Calif

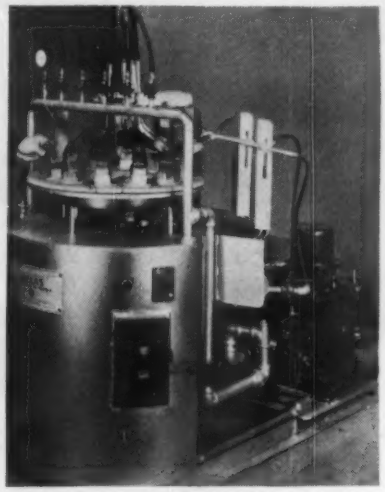
New Portable Instrument Measures High Speeds

The Celerimeter, 9x9x21 in. and weighing 26½ lb, measures machinery speeds ranging from 5 to 30,000 ipm. Device uses finest electrical components, such as synchronous-motor indicator which measures 0.01 sec intervals. The unit operates on 110-v 60-c supply.

An example of use is determining proper shot plunger speed on die casting machine.

Other measurements possible, some with minor adaptations to instrument, are pressure build-up time, compression period, complete cycle time, and conveyor speed.

Lake Erie Engineering Corp, Buffalo 17, NY

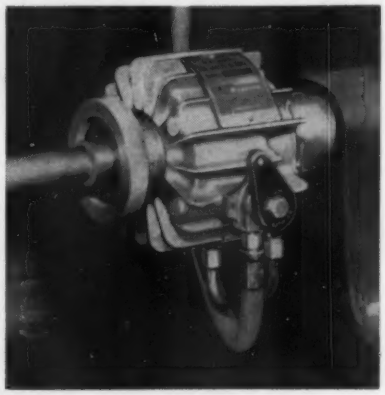


Automatic Brazing Unit

Automatic brazing for small and medium-size assemblies is provided by self-contained gas-fired packaged unit which is said to use precise control of combustion and automatic timing to produce sound, brazed joints of uniform high quality at high speed. Simple joints in small parts may be brazed by unskilled operator at 500 assemblies per hour.

Equipment mounted on structural steel frame includes: Selas combustion controller; adjustable Selas burners; permanent or replaceable fixtures; dial-type worktable to carry assembly past burners in continuous or intermittent motion; and all necessary timers, pneumatic indexing equipment, and electrical motors. Provision may be made for specialized functions.

Selas Corporation of America, Philadelphia 5, Pa



Air Collet Closer

Air-controlled collet closer is designed to replace levers and handwheels on engine and turret lathes of 1-in. bar stock capacity. A stationary oil-resistant inner tube is inflated by air to operate mechanism. Fingertip or foot control is provided.

Wilson Air Collet Closer, Inc, 909 40th Ave NE, Minneapolis 21, Minn

SIDNEY LATHES

ARE JUST RIGHT FOR YOUR

LARGER TRACER JOBS, TOO

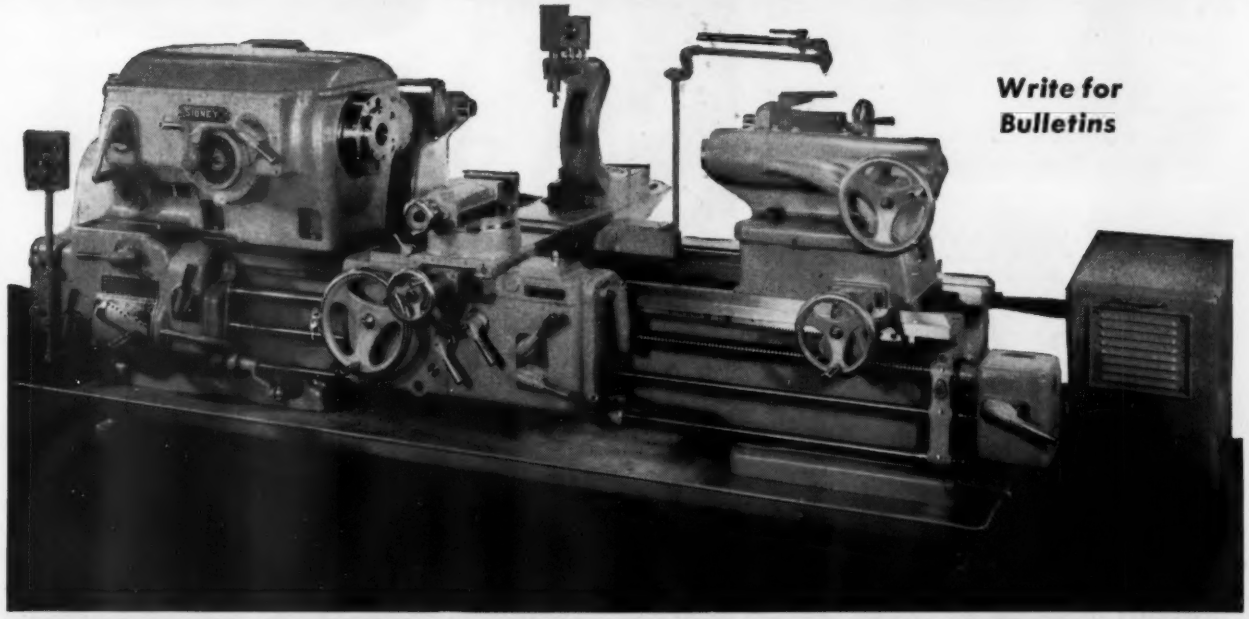
25" TRACER LATHE RAISED TO SWING 33½"

SIDNEY LATHES OFFER THE PERFECT COMBINATION OF RUGGEDNESS & SENSITIVITY

RUGGEDNESS AND BRUTE STRENGTH . . . for heaviest cuts and to withstand the most severe strains, power transmitting elements are made of unusually large proportions of finest, heat treated and hardened materials.

DELICATE SENSITIVITY . . . the Sidney FLUID TRACER permits unlimited reproduction, true to form in every detail.

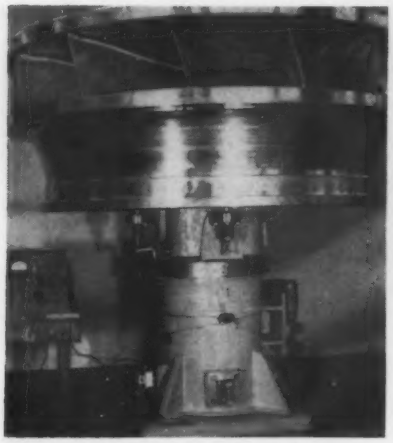
SIDNEY LATHES ASSURE FAST, ECONOMICAL PRODUCTION EVEN ON TOUGHEST TYPES OF WORK



Write for Bulletins

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904

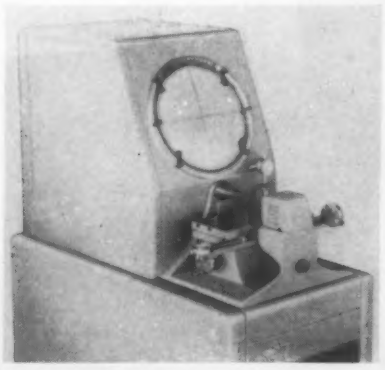


Dynamic Balancing Machine Handles Large, Heavy Items

Dynamic balancing machine built by Pelton, subsidiary of Baldwin-Lima-Hamilton, is a compact, self-contained unit, reportedly inexpensive, which lends itself to balancing large diameter flywheels, heavy turbine rotating elements, or other pieces to maximum weight of 250,000 lb. It can be mounted on shop floor or table of large vertical mill. Smaller size models have capacities of 100,000 and 10,000 lb.

Turntable rotation is variable between 10 and 20 rpm. It is supported on weighing shaft riding on antifriction bearings. The shaft is positioned on the lower end by four roller assemblies. Unbalanced forces are transmitted through the roller assemblies to leaf springs and then to the strain gage element of the electronic amplifier.

Pelton Water Wheel Co, 2929 Nineteenth St, San Francisco, Calif

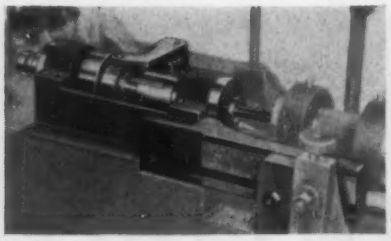


Contour Projector

Covel No. 14 optical comparator is a complete checking instrument for accurate measurement of difficult dimensions.

Measurements are taken directly from indicators. Unit has large capacity and optical arrangement for use in bright light.

Covel Manufacturing Co, Dept C-4, Benton Harbor, Mich



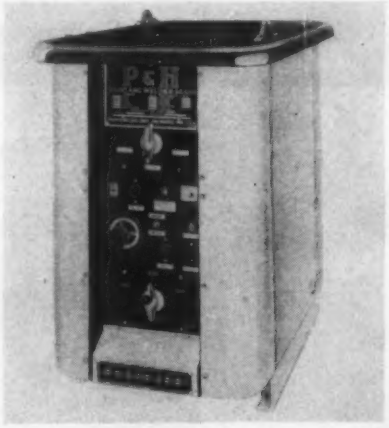
Small-Parts Lathe For Mass Production

Howard D-187 automatic lathe mass-produces parts up to 3/16-in. dia, 2¾ in. long.

Model uses same machine base, power units, and tooling employed on the ½-in. capacity Howard D-500. Spindle speeds up to 15,000 rpm under pressure lubrication assure unusually high finish. Sliding head, with completely independent pulley carrier bracket which eliminates all deflection of spindle and slide, holds extreme tolerances.

Attachments for drilling, chamfering, counterboring, tapping, threading, slotting, and tapering are interchangeable on both machines.

Detroit Cam & Tool Co, Howard Automatic Division, Ferndale, Detroit, Mich

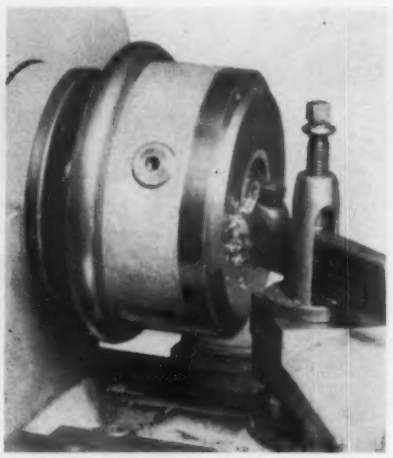


Versatile Welders

Two models, designated DA-200HF-GW (200 amp) and DA-300HF-GW (300 amp) are available, each adaptable to seven different welding processes.

Both can be used for metallic arc-welding, ac or dc, either straight or reverse. With proper torch, they can be used for inert-gas welding, ac or dc, and are said to be particularly adaptable to automatic inert-gas welding, and for Sigma welding. Use of a spot-welding gun converts them for fast spot-welding. Control, known as the P&H Dial-lectric, provides instant, stepless heat adjustment throughout entire range.

Harnischfeger Corp, Welding Division, Milwaukee 46, Wis

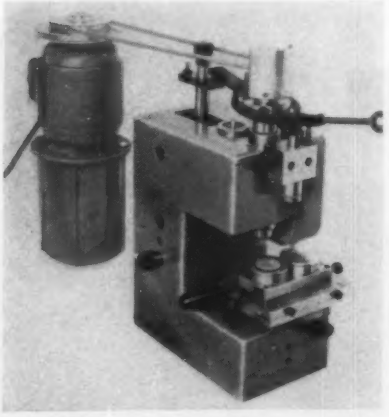


Magnetic Chuck Line

Line of permanent magnetic chucks introduced by Horton includes two rotary models: (1) parallel type, with parallel lines of force running entire width of chuck face, for holding small components and thin plates; (2) circular type, with circular lines, for holding rough surfaces, and for heavy-duty turning, milling, and shaping.

Rectangular units have lower over-all height which reduces size limitation on pieces to be held. Company states this chuck provides up to 18% greater holding power, and 50% or more usable magnetic surface than any comparable type and size.

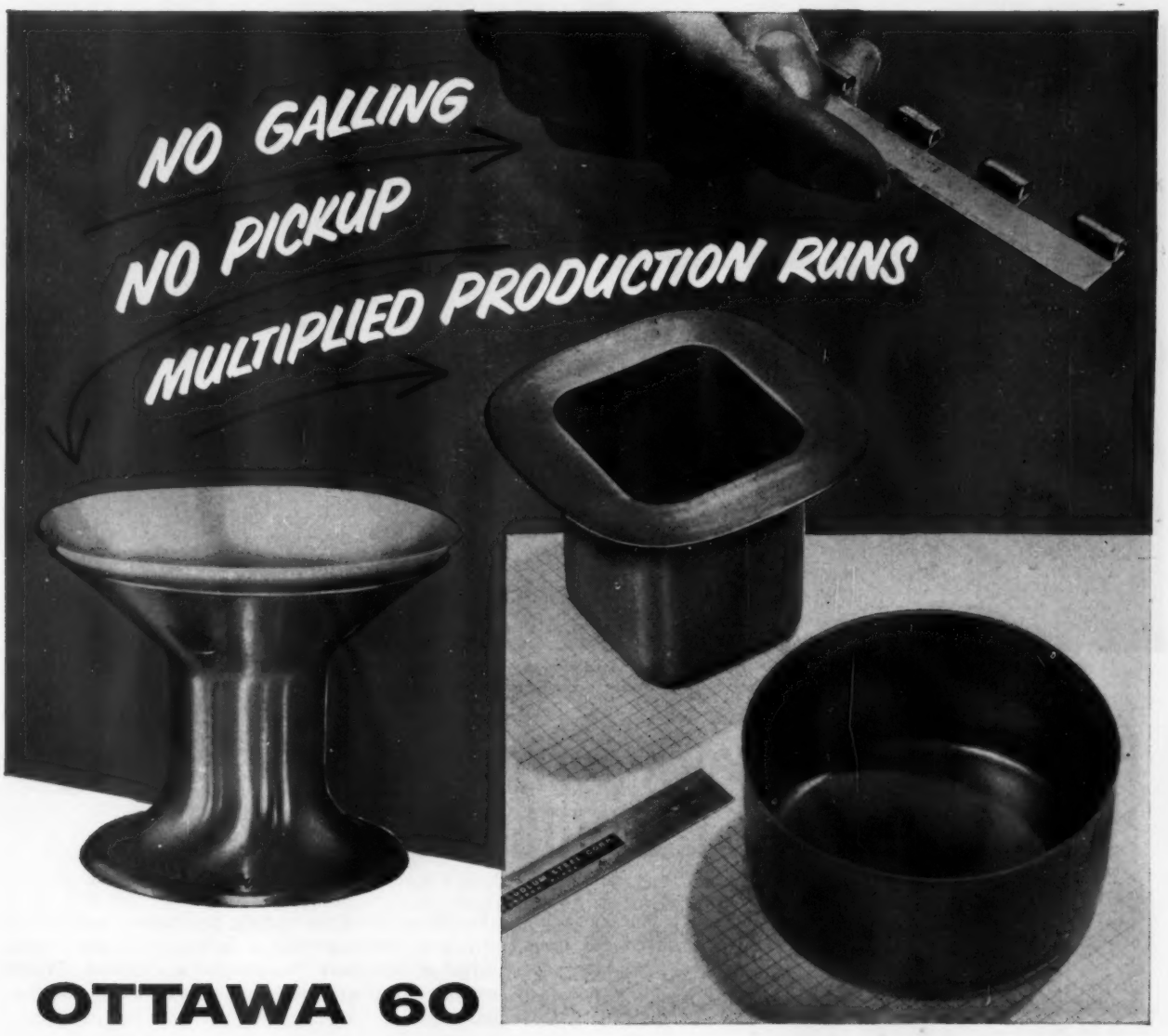
Horton Chuck, Windsor, Conn



Swiss Drilling Machine Has Automatic Feed

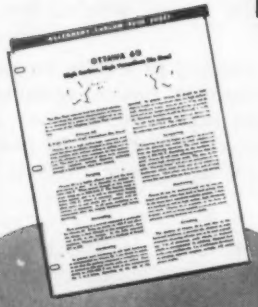
Swiss-built Posalux PEP 101 drilling and boring machine offers electro-pneumatically controlled feed and rapid advance and retraction of spindle. It is reported that deep holes in steel may be drilled without the use of drill jigs. Speed of spindle is up to 15,000 rpm. Capacity range is 0.004 to 0.15 in.

Imported by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, NY



OTTAWA 60

for DRAW DIES is *NEW...and NEWS!*



Write for a copy of the OTTAWA 60 BLUE SHEET

This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.

ADDRESS DEPT. AM-65

In fact, this exclusive Allegheny Ludlum-developed die steel is mighty *good* news for any user of draw dies. Ottawa 60 is a high-carbon, high-vanadium analysis, initially designed for the primary purpose of drawing stainless steel.

In that service, Ottawa 60 does just exactly what it was developed to do: it performs without galling or pickup, and shows exceptional wear-resistance—as a long list of successful applications will prove to you. Two of them are illustrated above: a stainless hinge and a stainless sundae server.

But Ottawa 60 is a top performer on any draw die application! Also illustrated above are the two draws on a transformer housing of .037" gauge SAE 1010 strip. After more than 25,000 pieces—*over 12 times any previous runs*—there was still no sign of pickup, or of wear on the Ottawa 60 punch or die.

This analysis can solve your draw-die problem jobs—or reduce your costs on almost any drawing operation. ● Call on our Mill Service Staff for any assistance. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

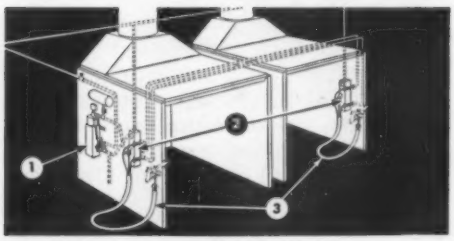
W&D 5581

AL® FINE TOOL STEELS SINCE 1854

The Plumbers Woodwork Co. manufactures wood and plastic Badger Brand toilet seats. Using the DeVilbiss hot-spray system, in its enameling operations for wooden seats, savings have been nothing short of spectacular.

Plumbers Woodwork increases paint mileage 94% with new DeVilbiss paint heater

This one DeVilbiss Water Heater serves all four spray stations at Plumbers. To add another station, a low-cost heat exchanger, gun, and hose are all that are needed!



DeVilbiss hot-spray system is foolproof; adapts to multiple gun hook-ups. Heated water from master water heater (1) heats paint in heat exchangers (2); heat-jacketed hose assemblies (3) keep paint hot right up to guns, assuring uniform viscosity at all times at each gun.

"Since installing a DeVilbiss hot-spray system, production costs have been cut remarkably, and we're getting a better paint job," says Fred Mueller, president of Plumbers Woodwork Co., Algoma, Wisc. "With one coat, we get complete coverage – faster drying, and a tougher, glossier finish.

"Paint stays hot right up to the guns, and we add no thinner. Overspray has dropped to a fraction of that of our former cold-spray method. Now, we apply pure paint to our wooden seats – without runs or discoloration.

"What's more, the DeVilbiss paint heater lets us reduce air pressure by two thirds – providing big savings in power, equipment replacement, and maintenance. Even more impressive, however, are spray-material savings. For now, one gallon of paint covers 97 pieces, compared to 50 pieces with cold spray – an increase of 94% in paint mileage!"

★ ★ ★

Why not call a DeVilbiss representative, today, to survey *your* finishing operations – show you the way to *better* finishing at *lower* cost? The standard components of the DeVilbiss paint-heating system can be combined in countless ways to meet your special needs.

THE DEVILBISS COMPANY
Toledo, Ohio
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FOR BETTER SERVICE, BUY
DEVILBISS

SPRAY GUNS • AIR COMPRESSORS • HOSE AND CONNECTIONS • TRANSFORMERS • SPRAY BOOTHS • ACCESSORIES

ROUND TABLE Discussion

BUMS' RUSH

Is it normal to expect the shop men to give a new engineer a hard time, particularly if he's pulled a few boners in the beginning? Can a foreman do anything to prevent it, or should he let the new man take care of himself?

I THINK IT IS A MISTAKE as well as an unjust procedure to have a new man come in to handle an engineering job when there may be many worthy fellows in the plant who are entitled to promotion. There are some situations wherein it is advisable to have an outsider take over a job, but under ordinary conditions, unless a man of extremely high qualifications is required, some one suitable for the job can be procured from inside the plant.

One cannot blame the fellows one bit for picking on the newcomer. They're sore, that's what; they're all hepped up because one of *them* should have been given the chance. Naturally they are going to oppose the idea and do everything they can to hinder the new man's progress. He may be a good guy and all that, and be well trained in college for the job, but, again why wasn't one of the fellows given the chance! Is it any wonder why the men should not do what they can to throw a brick in his machinery? Why should they jump in and help the guy when from their viewpoint it is wrong to have him there when one of the firm's old reliables is suitable for the job?

Now then, to look at it from the new man's side. If he is a bonafide engineer, coming into a new environment, it is an injustice to him to submit him to the opposition he finds. He is only human and desires to do his best. Should he not be given a reasonable length of time to prove himself?

Jack Everett
San Francisco, Calif

•

PROMISES, PROMISES

How flexible can an estimate be on the time involved for the completion of a job? Is the word of the man who will actually be doing the job accurate enough, or is it the responsibility of the foreman to set the time, subject to later amendment?

ED'S PROBLEM is one that worries a great many foremen. The main office is always wanting to get an estimate on this and that and seems disappointed if the foreman is not able to produce a price and time of delivery right there and then over the phone. It is a tough problem, too, because if the foreman estimates too high to protect himself against a slip-up in the machine work and still show a profit for the company, then some rival concern will probably underbid him and the company loses the job. The main office's estimate of the usefulness of the foreman falls several notches, and the foreman knows it is the main office who signs the check for his salary. On the other hand, if he figures close, and gets the order, and then the machinist or someone pulls a boner

NOW LET ME REPEAT- TIGHTEN THE BLANK IN THE VISE-USE A FAST FEED & SLOW STROKE- SPARK OUT ALL CLOSE DIMENSIONS- DON'T BURN TH' TOOL- BE SURE AND CHECK ROTATION OF THE GRINDING WHEEL- TH' BLANKS ARE IN THE CABINET WHERE YOU KEEP THEM. I'LL BE BACK LATER- BE SURE AND TIGHTEN THE BLANK IN- ETC-ETC
THERE'S A FEW LIKE HIM LEFT- MOST OF 'EM HAVE BEEN KILLED OR FIRED/ HE GIVES US COMPLETE WRITTEN INSTRUCTIONS WITH A DRAWING— NOT ENOUGH— HE MUST TELL US-OVER & OVER AGAIN!!!
BET YOU HIS WIFE WON'T LET HIM TALK AT HOME.
15 YEARS A JOURNEYMAN!
"THERE IS ONE IN EVERY SHOP"
LUHARTY

22.6% more air per power dollar

Floating *tank mount on DeVilbiss compressor outfits completely eliminates weld strains on the air tank. Heavy steel bands gird the tank, acting as a reinforcement, as well as a very solid anchor, between the compressor mounting and the four base legs.*

The efficiency of DeVilbiss air compressors means higher *actual delivery*—as much as 22.6% more air per power dollar than most other compressors. Many times, DeVilbiss outfits pay for themselves through lower maintenance and depreciation costs.

In addition to the tank mount, every DeVilbiss compressor includes these features: A.S.M.E.-approved air tank, check valve manifold, automatic pressure switch, diamond-bored pistons, cylinder head with removable valves, quality electric motor or gas engine.

If you have compressed air problems, let your local DeVilbiss jobber analyze your needs.

THE DEVILBISS COMPANY
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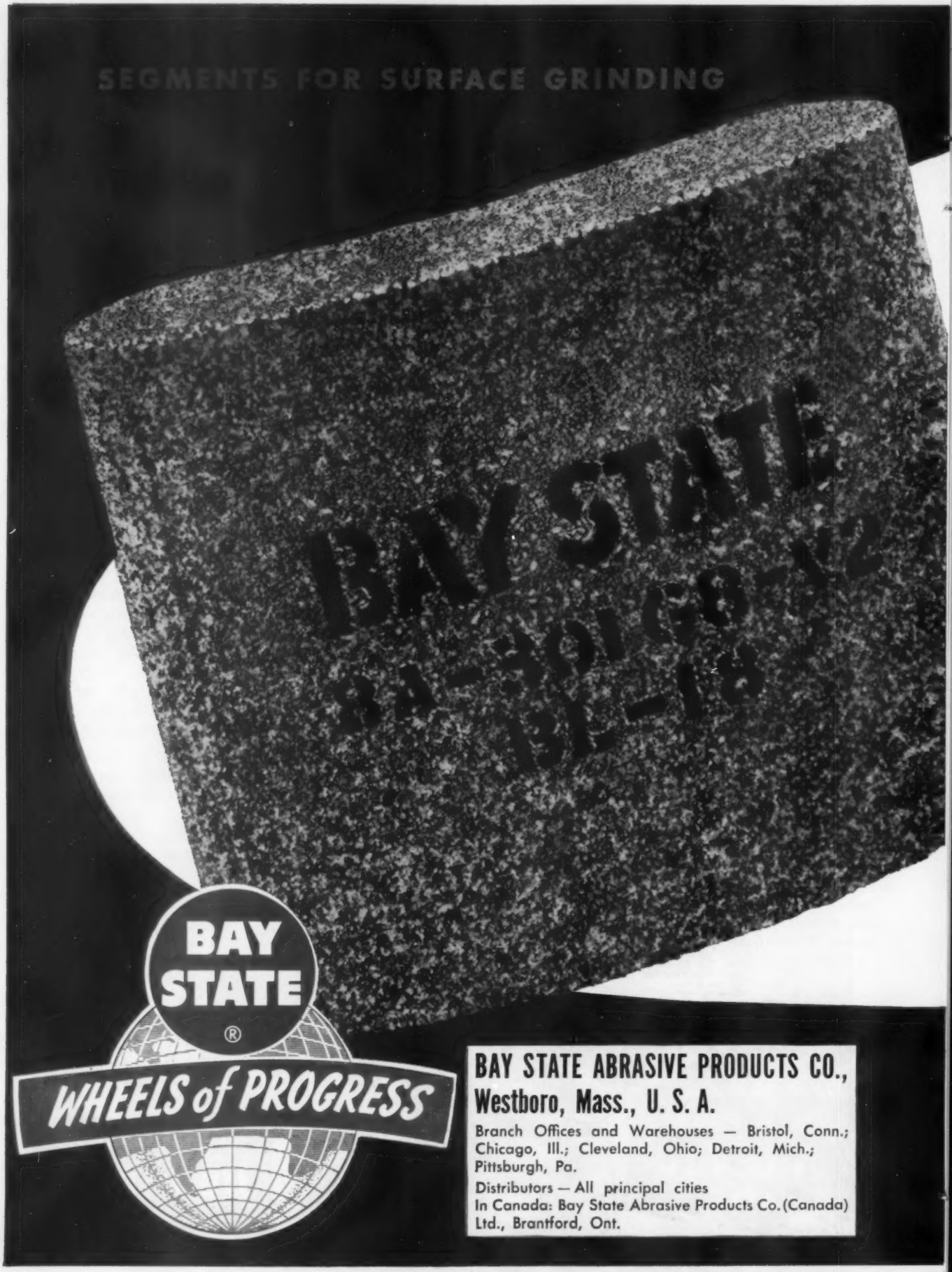
FOR BETTER SERVICE, BUY
DEVILBISS


SEGMENTS FOR SURFACE GRINDING
BAY STATE
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®
WHEELS of PROGRESS
BAY STATE ABRASIVE PRODUCTS CO.,
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Branch Offices and Warehouses — Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

WITH 1 "SPEC"... 3 METALS!

It took BAY STATE segments *and* engineering to lick this problem for a New England manufacturer! Distributor abrasive engineer Jack Somers did it, and gave the customer *extra* values too.

Here's how this problem was solved

Gear blanks, timing gear cases, transmission housings and other products . . . some of steel (both hardened and soft), some of aluminum, and others of cast iron . . . all had to be faced on rotating-table surface grinders. Obviously, savings could be made *if* the same set of segments could satisfactorily grind and finish all three metals.

Mr. Somers, using his specialized technical knowledge, proved it *could* be done . . . with the BAY STATE 8A-301G8-V2 specification.

Results: Cutting Action: EXCELLENT, on all three metals.

Segment Life: MORE THAN DOUBLE that of competitive specifications.

An *extra* value was the low cost of the "8A" abrasive, BAY STATE'S economy abrasive mixture which gives premium cutting characteristics at non-premium price.

Bay State can solve your grinding problems

Grinding gear case. Note how strobo-flash photo stops motion of coolant

Request BAY STATE'S free, "On-The-Job" engineering service (see coupon below), available through your local distributor, our district offices, or from Westboro.

This top-flight engineering service plus all the BAY STATE product superiorities, such as Fractional Grades (3 degrees of hardness within a single normal grade), Controlled Porosity, and the economy abrasive "8A" can bring about the solution to your grinding problems.

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WHEELS of PROGRESS

MAIL COUPON TODAY

Please send us Surface Grinding literature. ☐

We have a grinding problem. Please have a representative call. ☐

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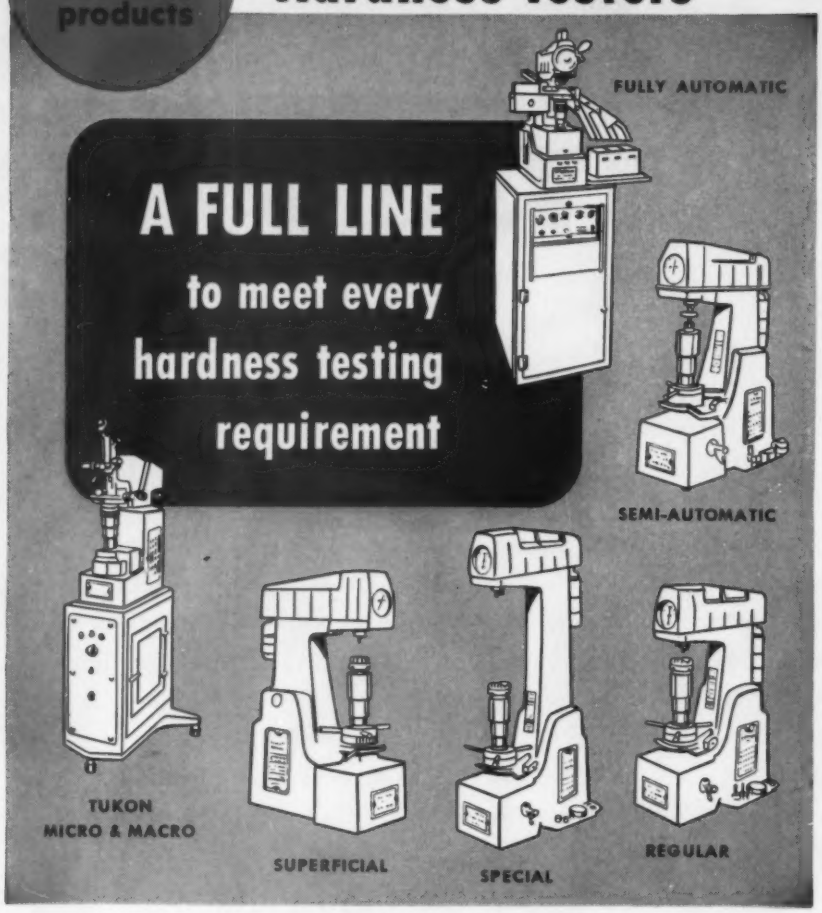
ACCO products

Wilson "Rockwell"* Hardness Testers



• Hardness testing standards of the metal industry have been set and maintained by WILSON "Rockwell" Hardness Testers since 1921. In steel mills, non-ferrous mills and metal fabricating plants everywhere, WILSON "Rockwell" standards have been the mark of perfection for a generation.

What is your testing problem? Whether your material is hardened steel, sheet metal, small parts, tools, rounds, tubes, soft metals or plastic materials—all are tested quickly and accurately by one of the many WILSON models.

WILSON "Rockwell" precision has made them the standard by which all other hardness testers are compared. The WILSON full line makes it unnecessary to compromise with less than the tester most suited to *your* requirement.

Let a WILSON expert discuss your hardness testing problem. There is no obligation.

**Trade Mark Registered*

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

plus BRALES and TUKON

and has to add extra time to the job, it is the foreman who gets the blame for the company losing money.

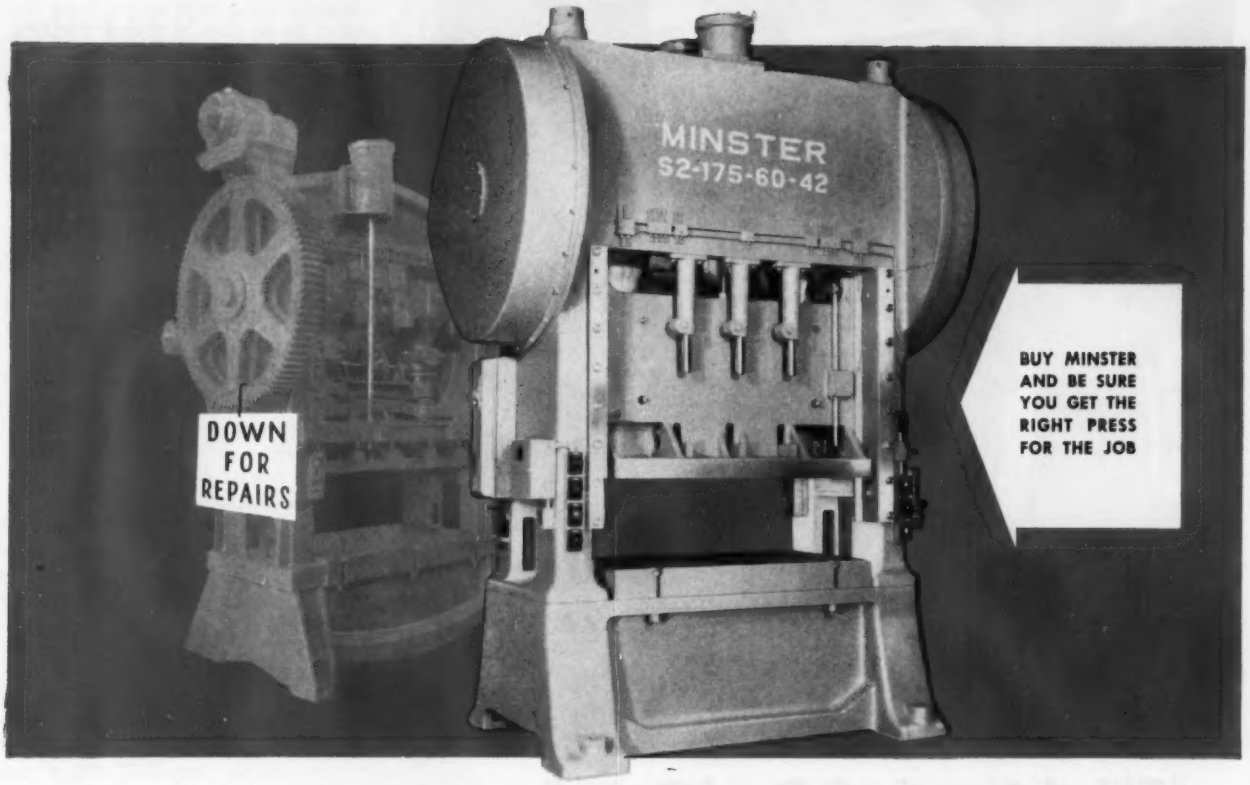
Ed is right about the average workman overestimating the time and cost. Most workmen will do that so as to be—as they think—on the safe side, but those kind of figures are very apt to lead to no business, as many foremen have discovered to their regret.

An experienced foreman generally has a good idea of how long it should take a machinist to do a certain operation, so he will break down the entire job into a series of operations, set down the time of each, and finally arrive at a total time estimate for the entire job. If the job is "rush" then a further step is made to determine if it can be split so that several men can gainfully work on separate pieces at the same time. Unless the job is urgent there will be a loss of time due to some parts having to wait for a machinist to get to them, since the various men will not be sitting waiting for their part of the job to be delivered to them—that is, if the froeman is on his job of keeping everybody busy all the time. These delays may increase the length of time the job is in the shop, but need not increase the cost.

Then there is the question of having the materials available. It is plain foolishness to send a close time and cost estimate to the main office and then, when the order is issued, find that the storeroom is temporarily out of stock of a certain specification steel and discover that delivery will take two or three weeks. Foremen get fired for boners like that and the wise foreman will put a "not to be used" tag on any scarce materials he has figured on for the job. Then he will send with

"It's not that I want more money myself. It's for the people I owe."

A Minster Press means
LESS DOWNTIME



Here is why Minster Presses on the job mean more production hours and less downtime for press repair!

1 ADVANCED DESIGN to give you the value of the best practices and latest improvements in presses . . . Box type construction for less deflection and better bearing support . . . Slides having longer ways fully supported and widely spaced . . . Large diameter connection screws . . . Method of taking up wear in lower connection bushings . . . Barrel slide adjustment on all sizes over 60 ton.
Clutch controls, both air and electrical, to improve press operation and production methods.

2 MINSTER'S PATENTED COMBINATION FRICTION CLUTCH AND BRAKE . . . One single automatically synchronized unit having air engaged multiple disc clutch and spring applied brake . . . Fast controlled engagement or disengagement at any point on 360° surfaces . . . Shock absorbing action . . . Exceptional friction surface life. *No more sledge hammer engagement, fast wearing and hard to fit replacement parts.*

3 PRECISION FITTING where it counts . . . Ways scraped to master gauges and square to the slide face . . . Bed scraped to surface plate . . . Bearing bores and bushings honed to fit . . . Ground spacers for maintaining proper gib clearance . . . Ground and roll burnished crankshafts.

4 MAINTENANCE INFORMATION AND OPERATOR INSTRUCTION applying to your press . . . A guide to preventive maintenance and operator training.

Let Minster help you plan your press replacement program

THE MINSTER MACHINE COMPANY
MINSTER, OHIO

MINSTER®
PRESSES

"This Warco's A Real Press" —

says experienced Press Operator

"I've worked medium and light presses for more than eight years," says press operator John Gallik, of the Midland Steel Products Co., Cleveland, "and this Warco 200-ton OBI is a real piece of machinery." Gallik's employers, the Midland people, one of the nation's foremost producers of automobile and truck frames, go along with the operator's opinion.

Nine years ago Midland bought their first Warco, and on the basis of performance have since added 49 others in various types and sizes. Midland, like so many of the nation's top manufacturers, finds one Warco invariably leads to another, and their press operators are happy about it.

Federal® WELDERS
Warco® PRESSES

The Federal Machine and Welder Company
WARREN, OHIO

his estimate a statement that "This estimate is good for 10 days only" or some definite date, and thus protect his reliability on keeping his promises.

Estimates on work with which the foreman is not familiar can be worked out by getting help from the man who will do the job. If he is a good and experienced workman he can be of help in giving the foreman an idea of the required time.

Watch out for the draftsman who marks very close tolerances on places where such limits are unnecessary. A pleasant conversation with him over the phone will sometimes result in a revised print being submitted and a very kindly attitude towards that machine shop may develop.

George P Pearce
Albuquerque, NM

IF ANYTHING has less tangible value than one promise it is two promises. In business, a promise is a doubtful thing. Where there is doubt there is no assurance of success.

In a well managed enterprise experience has long ago triumphed over hope. Line supervisors, those responsible for production, have a proper appreciation of their capacity to produce. A foreman makes no promises; he commits himself to deliver on schedule.

The majority of foremen employed by a large corporation are well trained men. They are trained at the company's expense. They are taught how to get along with people. Their ability is developed as regards getting the utmost of capacity out of the men, machines, and material placed at their disposal by top management.

Such foremen, given the facts, do not hesitate to give a completion date for any job entrusted to their

"Our milk shakes will be ready in a jiffy."

FOUR *REALLY TOUGH* MUELLER BRASS CO. REFRACTORY BRONZE ALLOYS IN ROD FORM

"TUF-STUF" ALUMINUM BRONZE
"600" SERIES BEARING BRONZE
MANGANESE BRONZE
ALUMINUM SILICON BRONZE

These four Mueller Brass Co. alloys have been specifically formulated to meet the demands of applications where manufactured parts must stand up under the most adverse operating conditions. While these alloys are tough, they are relatively easy to machine. Parts made from these alloys are in dependable daily service and range from marine hardware to valve guides in aircraft engines. As specialists in brass and bronze alloys, the Mueller Brass Co. can offer you the exact alloy best suited to meet the requirements of any application problem. Write us today for details.

NAME OF ALLOY	ALLOY NO.	YIELD STRENGTH AT 0.5% EXTENSION LBS./SQ. IN.	TENSILE STRENGTH LBS./SQ. IN.	ELONGATION % IN 2 IN.	BRINELL HARDNESS	RELATIVE MACHINABILITY —FREE CUTTING BRASS = 100%	ALLOY CHARACTERISTICS
TUF-STUF ALUMINUM BRONZE	224-E	60,000	90,000	15	175	30	Resists oxidation and retains strength at elevated temperatures. Lightweight. Used in aviation industry.
TUF-STUF ALUMINUM BRONZE	224-C	62,000	95,000	9	185	35	Properties generally higher than 224-E. Non-Galling. Acid and corrosion resistant.
MANGANESE BRONZE—A	241-A	55,000	78,000	20	150	25	High torque resistance. Tough. For screw machine parts and forgings — valve stems, balls, airplane parts.
MANGANESE BRONZE (HIGH TENSILE—GRADE B)	721	68,000	115,000	10	200	35	Highest strength of the copper base alloys. Good shock and wear resistant properties. Used for rollers, rotors, valve stems.
FORGEABLE BEARING BRONZE	600	40,000	78,000	15	165	25	For use where excessive pounding action encountered. Excellent bearing properties. For bushings, gears, marine hardware, etc.
FORGEABLE BEARING BRONZE	602	40,000	74,000	12	150	65	Used with hard or soft mating members that do not have a high polish. Modification of 600 alloy—for use where difficult machining is necessary.
ALUMINUM SILICON BRONZE	802	45,000	90,000	15	175	65	Excellent machinability for high strength bronze. Corrosion resistant. For pole line hardware. Non-magnetic.

149

MUELLER BRASS CO. PORT HURON 23, MICHIGAN

What is done is DONE... on the GOSS & DeLEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY PRODUCTION

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

supervision. They know their job. They have confidence in themselves.

A competent foreman, as the leader of his men, can rely on these working under his supervision to put forth an extra effort to help him out of a jam. A foreman, having acquired the knack of getting along with people, will receive considerable assistance from his supervisors and fellow foremen whenever he needs help.

A foreman is free to call upon staff specialists for whatever aid he may need. Modern industry is organized along a line and staff basis. Staff men are specialists. A large corporation has specialists in almost any line of endeavor one can imagine. When a foreman needs help he gets it.

Foremen working for small concerns do not have the advantages given to those working for larger companies. Nevertheless, small business must compete against big business. It can be done.

The consumer wants a quality product at a price he can afford to pay. Above all, he wants what he wants when he wants it. Quick delivery, on schedule, is a very important competitive factor. An enterpriser can beat out a competitor by getting there first with his product. Sometimes this factor is more important than cost. It is seldom more important than quality. Beware of short cuts in an established processing cycle.

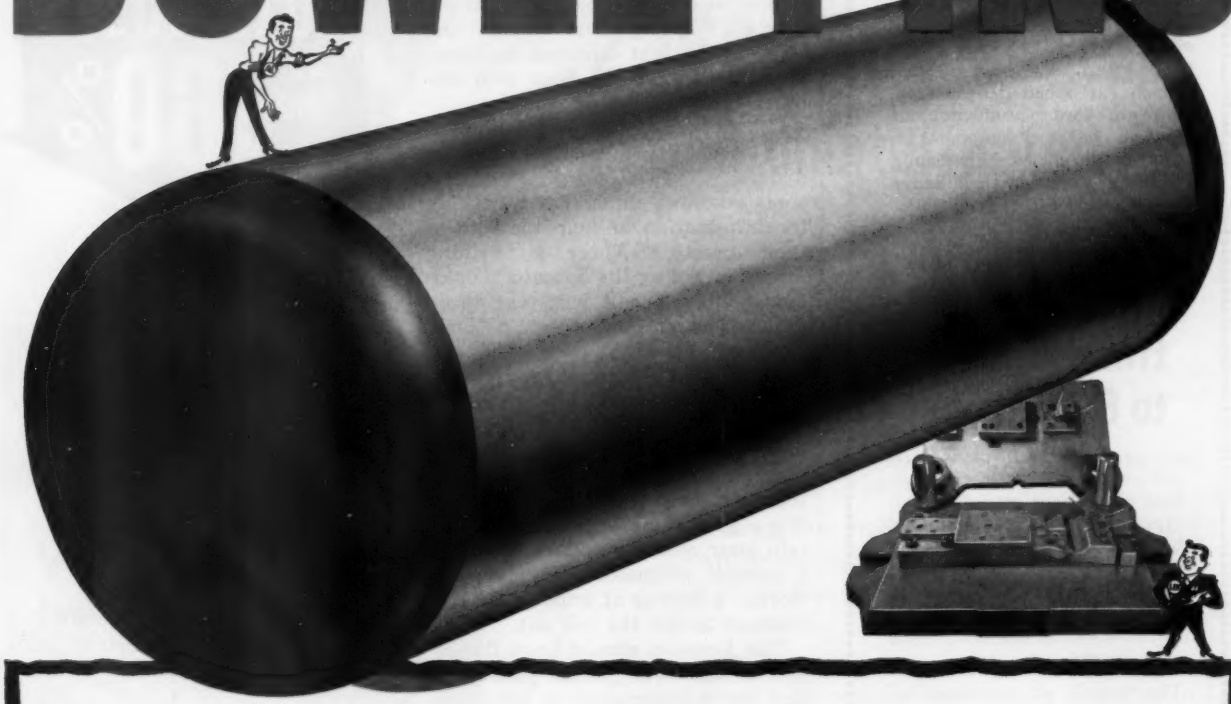
Getting there first requires more than know-how. One must also have know-what and know-when. A foreman must know what processing cycles are necessary and how long it takes to perform them.

When such is the case there is no guessing about delivery dates. The target date for the completion of any and every operation is quickly set and determinedly met.

One may ask, "What about waste and spoilage, red tape, absenteeism, equipment breakdowns?" We reply

"The Automation isn't ready yet!"

DOWEL PINS



HOW TO USE THEM

1. Precision Dowel Pins are principally used where parts must be accurately positioned and held in absolute relation to one another whether stationary or in motion. They facilitate quick disassembly and completely accurate re-assembly.

2. Allen Dowel Pins are also used as plug gauges.

3. As plugs for determining angular dimensions of dovetail slides.

4. As hinge and wrist pins in applications requiring initial and permanent accuracy.

5. As accurate, economical roller bearings and axles.

6. As guide pins, stops and position locators.

HOW TO JUDGE THEM

1. *On precision, for low tolerance applications.* (Allen Dowel Pins are ground to a maximum microinch finish of 6 RMS protected by a rust preventive.)

2. *On strength, for shear resistance.* (Allen Dowel Pins are made from special Allenoy Steel, heat treated. Single shear strength measures from 160,000 to 180,000 psi.)

3. *On hardness of surface and a core hard enough to prevent "mushrooming" when driven into a tight hole.* (Allen Dowel Pins have a surface hardness of 62-64 Rockwell C Scale and core hardness of 52-54. Average case depth .010 to .020 depending on size.)

The simple sure way to be sure of uniformly superior dowel pin quality is the same as in buying precision socket screws — *get genuine Allens from your Industrial Distributor.* Only he sells them but *we will welcome your direct request for literature or application engineering assistance.*

ALLEN HEAD

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

Available in 108 Standard Sizes from ⅛" x ⅜" to 1" x 6". Standard tolerance .0002 oversize. Most sizes also standard in .001 oversize for repair work.

You can be sure

you're planning your production properly if you've considered the advantages of

Marblette Plastic Tooling Resins

which can speed designs from drawing board to production run, require no heavy equipment investment or highly skilled labor, facilitate pilot runs and design changes, and

will save you up to 70% in time and up to 80% in cost

in making stretch dies, draw dies and panels, match dies, jigs, fixtures, patterns, models, prototypes, core boxes, plating shields, bag and contact molds, latex dip production forms, molds for fibrous glass lay-up, spray-metal backing, vacuum-forming, and electro-forming, and other types of tools and dies.

The versatile yet specialized liquid epoxy and phenolic resins developed by Marblette fit into your production picture. Convince yourself—see how they can give you increased economy and efficiency—use the handy coupon below for resin samples, technical data, a phenolic data folder, an epoxy data folder, and a conversion computer that shows at a glance how much resin to use for casting any size product or part.

Marblette

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Long Island City 1, N. Y.
We are interested in plastic tooling for

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Send us free
- ☐ Phenolic Data Folder
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Name.....

Title.....

Company.....

Address.....

that these are never serious problems in determining the time required to perform an operation. If such appear to be the case face your real problem. How can you get out of business before going bankrupt?

An enterprise in which management must go begging for a promised completion date for an operation is hopelessly out of date. To my way of thinking there is only one step in the right direction to eliminate this conidtion. Step into another business.

Peter A Seward
Swampscott, Mass

SOME FOREMEN think that by asking for information or help they lower their prestige. There is nothing wrong in asking the operator's opinion on how long it will take to do a job. The employee should know what jobs have to meet schedules and the importance of getting the job out on time.

Most shops have had a time and motion study made and are familiar with how long it takes to do the job. In a new size, or special work it is a good thing to take the worker into your confidence, in arriving on a mutual estimate. This gives the worker a feeling of importance, and a desire to get the job out.

The foreman should have the deside to talk over general production and the maintenance of schedules. It is a good way to enlighten the employees as to the whole objective. It is also a good way to develop organization in the department and shop. By sharing ideas and problems you often keep grievances at your own level.

A E Salmons
Philadelphia, Pa

THE PROBLEM OF FINISH-DATE determination has bothered small companies for many years. It is that oc-

"He's A Born Mechanic."

ELECTROLYTIC GRINDING with ELECTRONIC control CUTS COSTS as much as 60%

Anocut's NEW free manual tells how!

Here are the facts behind the theory, practical application and benefits of electronically controlled electrolytic grinding by new equipment perfected by Anocut Engineering Company. This informative manual covers the Anocut equipment necessary and its simple operation in grinding and shaping carbides, alloy steels and other hard-to-work materials. Presents documented field tests showing, for example:

Over 90% savings in diamond wheel costs
Far faster cutting speeds
Better, more uniform finishes
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POSITION_____

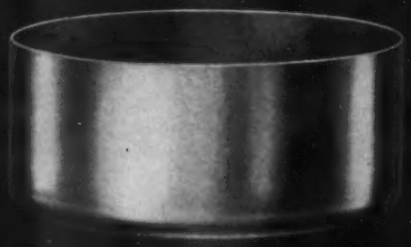
FIRM NAME_____

ADDRESS_____

CITY_____ STATE_____

Joe Vuille says it's simple arithmetic:
"180 cups per min. x 60 min. x 40 hours per week x 5 weeks =

2,160,000 brass cups in one uninterrupted run"



From the cup illustrated actual size above, socket shells are produced in eight operations on special equipment, followed by a stress-relief anneal and a final bright-dip.

Socket shell caps like this are formed in an 8-operation multiple-plunger press at the rate of 86 per minute.

Typical of Leviton's complete line of lampholders is this "Electrolier Push Thru" model. Both shell and cap are made of ANACONDA Brass.

For more than 20 years, Joe has been pressroom foreman of Leviton Manufacturing Company, Brooklyn, N. Y., one of the world's largest manufacturers of electrical wiring devices.

Multi-million production runs of stamped and drawn products are nothing new to Joe, but he'll admit that there's more to it than a multiplication table:

"First," says Joe, "you start with a good product design. Then the toolroom calls on its broad experience in diemaking. Next, good equipment and good housekeeping are essential in the pressroom. And then there's the brass: these extra-large coils of brass strip have to be just so . . . in dimension, composition, grain size, temper and surface finish . . . lot after lot after lot . . . tailor-made for the job."

Each year Leviton uses many thousands of pounds of ANACONDA Brass, produced to Leviton's precise specifications, "just so . . . lot after lot after lot . . . tailor-made for the job." Perhaps we can perform a similar service for you? Write to *The American Brass Company, General Offices, Waterbury 20, Connecticut.* In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario.* 5579

You can always depend on

ANACONDA®

copper, brass and bronze

ANOTHER EXAMPLE of

Save time and labor with Microloy, Capewell's non-deforming, oil-hardening tool and die steel that combines a tough cutting edge with extremely close retention to size after hardening and tempering. It is ideal for tools and dies where construction does not permit grinding to shape after heat treatment. Because of its superfine surface finish (10 to 25 micro-inches), Microloy is excellent for template work and for many tools where exact size and shape *must* be maintained.

CHECK THESE OTHER COST-CUTTING CAPEWELL PRODUCTS

Power Hack Saw Blades
Band Saw Blades
Hand Hack Saw Blades
Machinists' Hammers
Wrenches
Pipe Tools

6 big features...

- Deep, uniform hardening.
- Precision-ground to close tolerances.
- Uniformly annealed for easy machining.
- Guaranteed free from decarburization.
- Available in wide range of sizes.
- Exceptionally smooth surface finish.

Always Consult Your Distributor

- *Your best source of information.*
- *Your best bet for prompt service.*
- *Your best friend in an emergency.*

THE CAPEWELL MANUFACTURING COMPANY
65 Governor St., Hartford 2, Conn. 11CA55

casional job or a multiple of small jobs which cause trouble. The work is never long enough or of enough volume to develop times for operations by time study. The guessing game, which is so often not even close, has become outdated. First, such practices either obtained the job at a loss to the company or they were out of line and the job was lost to start with. Either way, the profit for the company was gone.

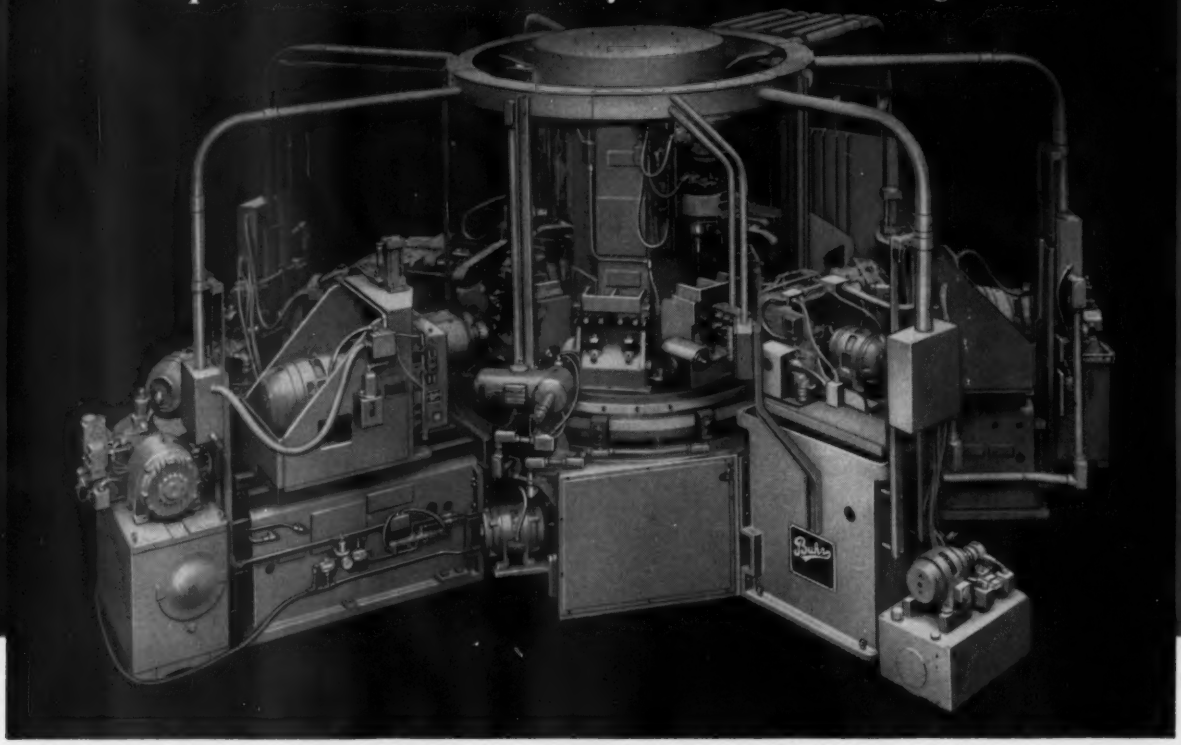
As jobs reached the shop floor, after being finally obtained, no guide was ever set for the shop foreman. He was asked how soon and the answer — whatever it was — was never soon enough. The foreman was not sure, so he asked the workers. They, naturally, are not estimating close, for no worker regardless of the type of work or job he is doing will knowingly short-change himself. So we find an unhealthy situation established. Schedules are needed, and to meet competition today they must be right. They must know and reflect the requirements of the shop.

Those developing the delivery promises must take many things into consideration. It would not be wise to try to name all of them for in each case the total will vary. However, one important factor is present volume of work and its schedule date. Is this date a must, or can it be flexible enough to allow a rush job to be entered? What is the machine load in the shop? Have you enough skilled workers to place on machines if that is the bottle-neck point? It is more than just looking at part XYZ and guessing it will take 110 hours to complete with 3 men. Suppose you are off 10 hours in your calculations—this might mean a loss of up to 50 or 100 hours to the company, as well as a loss of the business for any future orders from that com-

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Mills, core-drills, drills, semi-finish bores, chamfers and taps 288 master-brake cylinders an hour gross!



Rough castings are loaded in pairs in this 10-way 7-station hydraulic-feed center-column Machine.

Equipped with 72″-diameter 7-position automatic power-driven heavy-duty index table, complete with two shot bolts.

For extreme ease of servicing and maintenance, automatic indexing unit slides out *without removing table.* This is done simply by detaching cover on front of Machine.

Other features of Machine include automatic hold-down clamp at rough-and-finish milling station, automatic rotating chip conveyor, power clamping and automatic lubrication.

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

Let us show you how Buhr Economation can reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO. ©
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

McCaskey Tool Crib Control, adapted to the unique production needs of U.S. Naval Ordnance Plant, Indianapolis, pays dividends in . . .

BETTER TOOL CRIB SERVICE with BIG SAVINGS in TOOLS and SUPPLIES

The Naval Ordnance Plant, Indianapolis, may be classified as a large jobbing shop developing, fabricating and assembling precision instruments. Approximately 20,000 standard tool items, together with consumable supplies and special tools, are required for normal production needs.

Six McCaskey-controlled floor cribs in addition to a large main tool stores crib provide prompt, economical tool service. They are operated under the supervision of Harold E. Evans, Head of the Tooling Division. He writes that their use of McCaskey Tool Control methods has given them:

. . . improved service at the crib windows;

. . . constant control of all tools;

. . . rapid, accurate clearance of terminating employees' tool charges;

. . . a 40% saving in procurement of standard tools and consumable supplies in first year's operation;

. . . monthly report of the cost of worn and damaged tools and miscellaneous consumable materials chargeable to each unit that is effective in holding them at a minimum;

. . . usage factor on all tool items that provides basis for reducing crib inventories;

. . . Broken or Lost Tool Report procedure that has reduced misplacement and loss of tools and makes available valuable data on reasons for breakage and for inventory and cost records.

Large or small, one crib or a dozen, similar results from improved tool crib control methods can be yours, too. Investigate NOW! Mail coupon for step-by-step procedure and detailed reports from representative users.

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street
Chicago 18, Ill.

Send me all the facts on McCaskey Tool Crib Control.

Name.....

Position.....

Company.....

Address.....

AM-5-55

McCaskey
INDUSTRIAL CONTROLS
TOOLS - PRODUCTION - COSTS
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Victor Adding Machine Co.,
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street, Chicago 18, Ill.
Galt, Ontario, Canada

pany if non-delivery becomes an issue.

Today a foreman must either be given the proper schedules and be expected to meet them, or he must be able to use the proper tool to estimate carefully and schedule the jobs in his department. Either way it becomes more than just looking at the finished part. It means layout of operations and establishment of the time elements for these operations. Allowance for operational difficulties, set-up and other incidental factors must be taken into consideration.

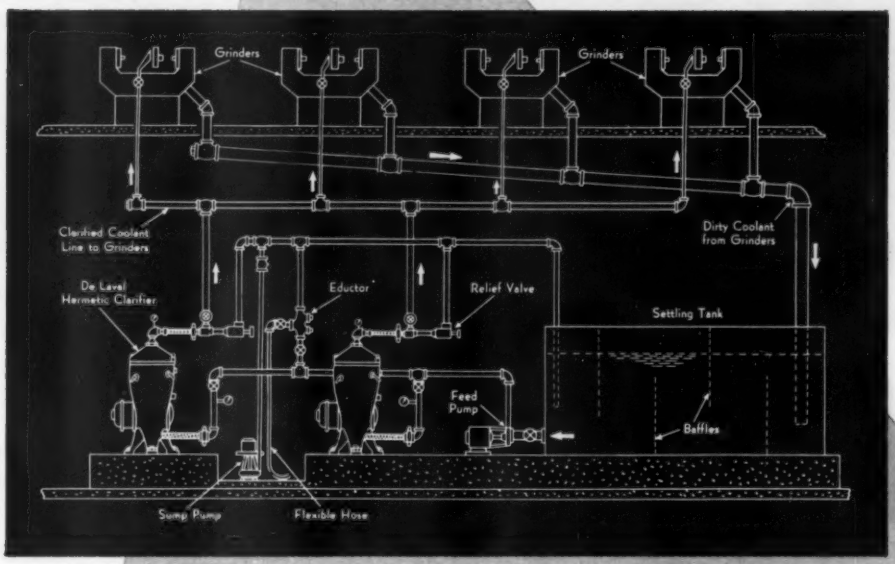
It is indeed a specialized job if each problem must be worked out each and every time. However, with proper technical guidance, and assistance from trained professional engineers, a chart of time elements for operations can be established. From this chart both the original estimator and the foreman are kept in step. The original estimator does not have to rely upon memory or complex calculations; he can reduce the job to operations, list these for future use, and apply time elements to operations. Totals arrived at give the shop time, and then by using a load schedule by machine or departments, can establish closely the final finish date.

Here it is possible to juggle schedules if it is necessary. This, however, is not recommended for too often the juggled item is also a "hot" one which the estimator has forgotten about. Also, always consider the schedule fixed when quoting. Then if the job is obtained and it is absolutely necessary to better deliveries, take time to study all jobs affected both from promised date and upset in the shop.

Many times foremen are expected to stop a machine which requires hours of setup time just to run 50 pieces of another hot job on it. Expensive? Definitely! But it is done. It

Another DE LAVAL

LAYOUT...FOR PROFITS



This is the layout of a typical De Laval Continuous Grinding Coolant Clarification System . . . with De Laval "Hermetic"® Clarifiers below the grinder floor.

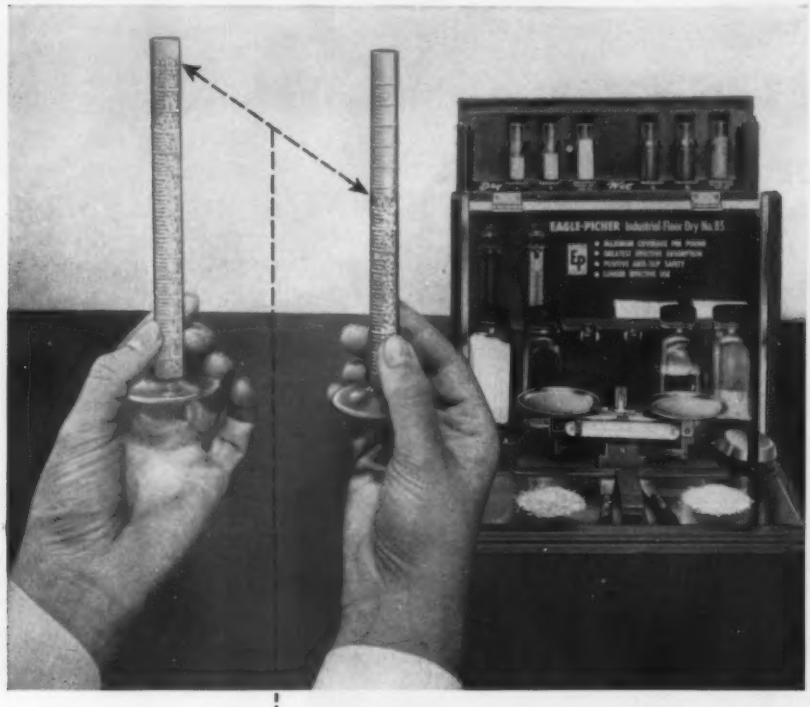
Similar De Laval Systems . . . custom engineered to specific requirements . . . save money, improve finishes and increase profits in many leading plants.

De Laval Coolant Clarifiers handle either oil or aqueous coolants with equal efficiency . . . lengthen grinding wheel life . . . minimize wheel dressing and wheel loss per dressing . . . greatly increase coolant life—*pay for themselves quickly!*

Write for full information . . . *now!*

DE LAVAL
grinding coolant clarifiers

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • **DE LAVAL PACIFIC CO.** 61 Beale St., San Francisco 5



There's a BIG difference in floor absorbents

TEST IT Yourself!

IN YOUR OWN OFFICE, make this simple 15-minute test. Compare Eagle-Picher Industrial Floor-Dry to any other floor absorbent.

HERE'S WHAT YOU'LL PROVE TO YOURSELF about safe, skid-proof Eagle-Picher Floor-Dry: It's extremely insoluble, absorbs more oil and water. It goes further, provides much greater coverage. It reflects more light, brightens the work area. It's non-combustible, has no chemical reaction. It lasts longer, saves you money!

Since 1843 EAGLE EP PICHER

WRITE TODAY. Our Eagle-Picher representative will bring the portable laboratory to your office where you may make this test yourself. The Eagle-Picher Company, Cincinnati 1, Ohio.

is being done today in your own shop on some scale.

We come back to our problem, should a shop make promises? No . . . only when two or three heads are put together to get a decision. This applies on brand new jobs where no experience has been had and no true elements are established on the time chart. Then call a conference to help develop the first time standards for the job. Check these against known values of similar work. If in line, then apply to the job to determine delivery.

Remember that human nature plays a big part in guessing on finish dates. Suppose Joe, the lathe operator, gave you 20 hours . . . wouldn't you add 5 or 10 more before you told your boss? Your boss in turn would add another 5, 10 or 15 hours to that figure "just to be safe," . . . and so it goes. Before you know it the job is out of line on time and cost. No guess-work allowed; use time standards for promised deliveries and cost analyses.

C D Townsend
West Hartford, Conn

WHETHER IT IS STILL in effect or not, I do not know, but years ago the so-called "promise" system was adopted in a plant in which I worked and it met with varying degrees of enthusiasm. There were some who said that it was fine—that type which carries a shiny-red apple at all times—others who did not like the idea of pinning themselves down to anything definite about when they could complete anything; while many looked upon the idea as infringing upon their rights to take as much time as they liked to in order to do a job.

At first it called forth the harrowing groans of disapproval and was looked upon as over-systemizing instituted by a new official. My own personal opinion was that it constituted a very large roll of bright red

NICHOLS TWIN MILL

two heads are better than one ....for sure!

The Nichols Twin Mill is something new in duplex millers — a precision 2-spindle bed-type miller designed for simultaneous light duty milling of opposite or adjacent surfaces, using **horizontal or vertical spindles.**

The Twin Mill provides unmatched flexibility! It is equally adaptable for long-run or short-run jobs. The two geared milling heads are independent units, with separate 1 HP motor drives, and are quickly adjusted either directly opposed or offset longitudinally, vertically or transversely. Set-up is fast and simple.

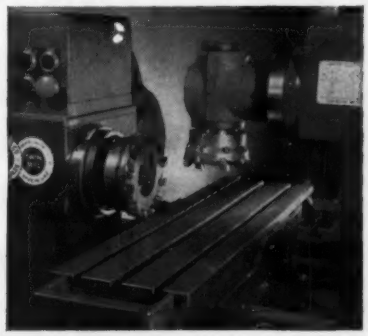
The wide range of spindle speeds from 55 to 2050 R.P.M. allows milling of ferrous or non-ferrous materials with high speed or carbide tipped cutters, producing EXTRA FINE FINISH while maintaining the closest tolerances with ease.

The Twin Mill is completely push-button controlled, arranged for automatic table cycling—with rapid approach, hydraulically controlled variable cutting feed and rapid return. Available with automatic retraction of milling heads, automatic spindle brakes and carefully engineered special features to meet specific applications.

The parts shown are typical of those on which the Twin Mill is cutting costs and boosting production. Investigate the savings it can make for you. For details write to Nichols-Morris Corporation.

CONDENSED SPECIFICATIONS

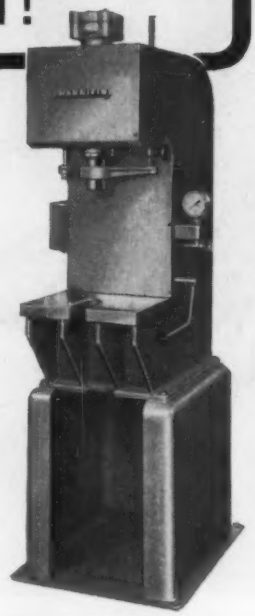
Table, working surface	8⅝" x 30"
Table Travel—cutting stroke	11¾"
Motors	(two) 1 HP
Spindle Speeds (15)	from 55 to 2050 RPM
Max. height center of spindle above table	11¾"
Max. offset of spindles (horizontal)	8½"
Max. distance between spindle noses (across table)	16"
Floor space required	64" x 56"



Manufactured by W. H. Nichols Company, 48 Woerd Avenue, Waltham 54, Mass.

76-F Mamaroneck Ave. NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION** **White Plains, New York**

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 317 S. Wolf Road, Des Plaines, Illinois

Everyone recognizes this as a sign of law and order...

And smart gear users know this CINTI is the sign of *good* gears made to *your* specifications.

May We Send You Our Brochure?

CINTI®

"Gears...Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO

tape and by the time it was in working order we all were seeing red. One thing it did do—it eliminated the easy way out—passing the buck.

Here is an example of the way it worked. After reading it you can form your own conclusions as to whether it is a good thing or not. A production order came through for a hundred left-handed doodads, nickel-plated and highly polished Along with the order came duplicate promise sheets—one red and the other light green. One of these was to be filled out and returned to the sender with the date when the lot was to be delivered to the polishing department. If any tools were needed for the job, an order had to be placed on the toolroom who, in turn, swore by the gods that it would have the tool completed for the job by a certain date. Assuming that the toolroom foreman made a good guess, and there was no delay in delivery of the die to the press room, all would be hunky-dory but, if the toolroom foreman had any reason to know or surmise that the tool would be delayed, he reached in one of his pigeon holes for form #760937521-AX -54 and he would thereupon go into a conference with the man working on the die so as to arrive at a new completion date. He would fill out the "Extension of Date Promised" form #760937521-AX-54 and send it on to the press department foreman so that he could revise his original promise to the polishing department by filling out his "Extension of Date Promised" card #760937521-AX-54. If it so happened that the die arrived on the date promised by the toolroom foreman all well and good, but if for one of many reasons it could not be delivered in time then a second "Extension of Extended Date Promised"—a new form of a different color, likewise numbered

"I'd like to see some Guaranteed Annual Work around here!"

Announcing . . .

a portable, bench-type comparator for either horizontal or vertical projection . . .

the KODAK CONTOUR PROJECTOR, Model 8

Here's how Kodak brings you new economy in checking small parts by projection gaging:

Two-way staging: Parts can be staged in simple holding fixtures for horizontal projection on the Model 8. Or you can turn the machine on end for vertical projection and simply lay the workpiece on an easily mounted plate-glass stage. Only Kodak provides this choice to simplify your staging.

Choice of magnification: Six precision projection lenses (10×, 20×, 31¼×, 50×, 62½× and 100×) are quickly interchangeable, seat positively for precise rated magnification.

Large work area: Kodak's unique relay lens system gives you uniform, ample working distance at *all* magnifications.

Easily portable: The cast-aluminum Model 8 is easily portable, designed for use on bench or table.

Bright screen image: Coated lenses which increase light transmission—plus a special Fresnel lens back of the screen—yield a bright image, permitting you to use the Model 8 anywhere in the plant.

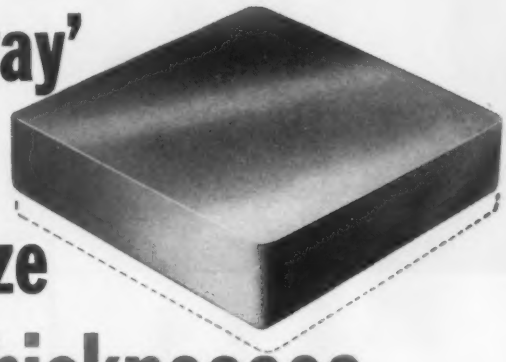
Optical stability: Kodak's famed Ektar Projection Lenses and rigidly built lens mounts and housings insure accurate performance year after year, provide precision equal to that of large toolroom projectors.

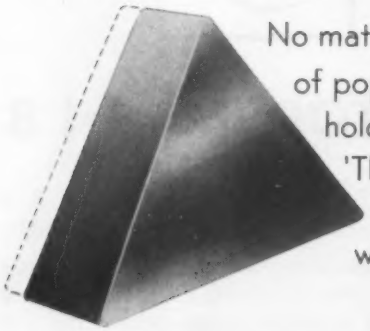
Easy to use: Operators learn inspection procedures quickly, using optical gaging on the Model 8. Erect, right-reading image with both vertical and horizontal projection cuts down training time. Air-cooled lamphouse and handy controls assure operator ease.

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

NOW!
for the first time... new, lower cost
ADAMAS
'Throw-Away' blanks — each size in two thicknesses





No matter what your choice of popular 'Throw-Away' blank tool holders . . . you'll find an Adamas 'Throw-Away' blank specifically engineered to fit perfectly with your tooling requirements.

Adamas 'Throw-Away' blanks are available in utility grind (top and bottom ground only) and in precision grind (ground on all surfaces for precision indexing). For more pieces between indexing — lower production costs — order Adamas 'Throw-Away' blanks in either standard or premium carbide grades. Call your local Adamas representative or write Department 41-C, ADAMAS CARBIDE CORPORATION, Kenilworth, New Jersey for price lists

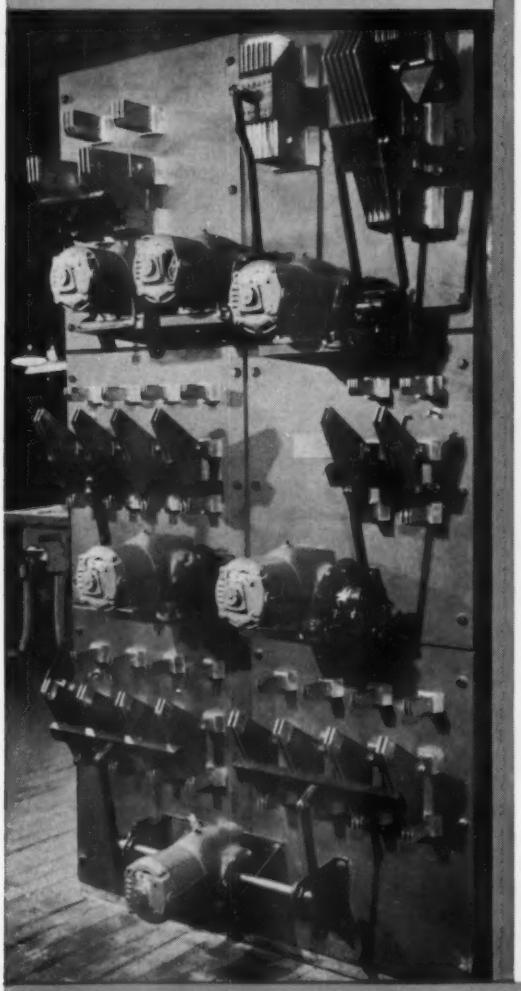
ADAMAS CARBIDE CORPORATION • KENILWORTH, NEW JERSEY

to add weight to its importance—card would arrive at the press room. The press-room foreman would no doubt say "Oh shucks," and proceed to make out a request for an extension of time.

And so it went on from department to department until the lot was shipped. Now it is very evident that there could be no passing of the buck with such an arrangement, but it is also evident that there is an abundance of paper work and accompanying headaches as a result of having to comply with the details of the scheme. Is the old scheme better? Let's take a peep at the days before "promise" made its appearance.

The order came through for the hundred left-handed doodads and Bill, the foreman of the press department, sizes up the situation and finds that he has to have the blanking die gone over after the man on the night crew botched it up and told no one about it. Bill takes it in to Harry, the toolroom foreman, and after a consultation, Harry says he'll get right after it. Harry slides it beneath the bench for safe keeping and Bill goes back to his worries. A week later the Super arrives at Bill's desk and wants to know about the order of doodads. Bill tells the Super (JD,) that he took the die in to Harry and that Harry told him that he would get it right out. JD finally corners the toolroom foreman. "What die?" replies Harry. JD high-tails it back to the press room. Now JD and Bill arrive at Harry's desk and demand a showdown. After Bill points to the hiding place beneath the bench, he and his lieutenant return to their department, leaving JD to handle Harry. Harry finally compromises by telling JD about a secret fishing hole and they make arrangements to take it in on the following Sunday. The die is finally turned over to Bill, who gets hell aplenty from Harry for squealing on him, and in short order the left-handed doodads are delivered to the polish-

Geared for smooth, slow speed



SIX Century Performance-Rated® GEAR MOTORS

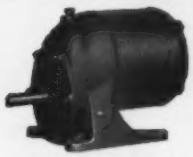
power this remote controlled Automatic Switch. These gear motors are ⅓ H.P., 5 r.p.m., right angle shaft.

Whatever your slow speed needs . . . from 4.3 to 780 r.p.m. . . . Century Gear Motors provide compact, quiet-running units hardly larger than conventional motors . . . in ratings from ⅛ to 150 H. P.

For quiet, dependable service, helical gears with "rotational tooth contact" help prevent uneven wear and minimize vibration. Extra-width pinions provide strength for greater shock load resistance and longer life.

Tapered roller bearings enable the gear shafts to withstand radial and thrust loads without strain on the motor. Oil tight shaft seals make these motors particularly adaptable to shaft-down mountings on processing jobs where contamination is a problem.

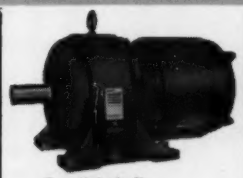
Whatever the speed and power characteristics you need . . . AC or DC . . . Century Motors are Performance-Rated to do the job with top efficiency. For information, call your nearby Century Sales Office or Authorized Distributor.



Parallel shaft, single reduction . . . 280 to 780 r.p.m. . . . ⅛ to 150 H.P.

Right angle shaft, single reduction . . . 25 to 280 r.p.m. . . . ⅛ to 3 H.P.

Parallel shaft, double reduction . . . 37 to 280 r.p.m. . . . ⅛ to 150 H.P.



Parallel shaft, triple reduction . . . 7.5 to 37 r.p.m. . . . 1 to 150 H.P.

Right angle shaft, double reduction . . . 4 to 84 r.p.m. . . . ⅛ to ¾ H.P.

9

Performance-Rated® Motors ⅛ to 400 H. P.

CENTURY ELECTRIC COMPANY

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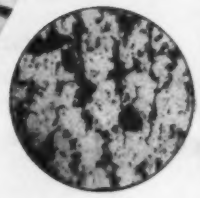
select most practical

coolant cleaning

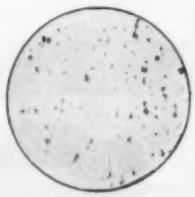


Composite swarf from wet O.D. grinder — magnified 60 diameters.

USE **BARNESDRIL** LABORATORY RESEARCH

Composite steel swarf from super-finish grinder — magnified 60 diameters.

To help you get production efficiency in the use of coolants, BarnesdriL maintains complete laboratory facilities for testing samples of contaminated coolants and other industrial fluids. From these tests, the characteristics and quantity of contaminants can easily be determined, and studied for recommendation as to the best possible method for efficient removal.



Composite honing swarf — magnified 60 diameters.

When you have coolant purification problems send them to BarnesdriL Engineers.

COOLANT BARNESDRIL CLEANING

FILTRATION DIVISION
BARNES DRILL CO.
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

er, then farther on to the plater, providing that no delays are caused by any oversights in the meantime.

There you are folks. Which system do you prefer? The one that gets every man on his toes by having him back up his signature with results, even though it does make a nervous wreck out of him, or the one where red tape is thrown to the winds and every one has a good time at the company expense?

J Homewood
Burbank, Calif

•

SLIDE-RULE FOREMEN

Does the engineer, appointed shop foreman, have a strike against him in the men's eyes? Will they resent the fact that he hasn't worked up from the ranks? Can he make a good foreman?

THE "SLIDE-RULE FOREMAN" is a product of this new age of electronics, complex automatic machinery, and highly specialized shop processes. It is also becoming quite evident that the engineer-foreman with his slip stick is essential to our further industrial development and progress. Industrial production, tomorrow, can be expected to far surpass the mechanical and electronic complications that we now know. Thus, highly technical jobs will develop in production requirements; jobs requiring extensive shop experience plus engineering skill. Even now, the once theoretical sciences are knocking on the shop door.

Tomorrow's foreman will not only have to know how each operation is performed, but why it is necessary, how the material reacts to the operation, and the critical requirements of each part. Also, he will have to have a good grounding in industrial organization plus a knowledge of human relations. He must be trained to readily absorb new methods and to adapt existing tech-

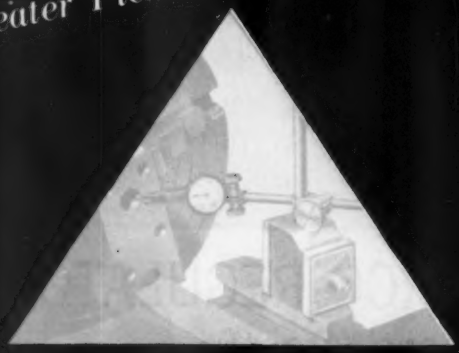
(Continued on page 229)

"Well . . . think you can handle it?"

Easier!

Faster!

Greater Flexibility!



Powerful permanent magnet energizes both sides and bottom of Magnicator base for holding to flat surfaces. V in top holds to round surfaces.

New holding tool for dial indicators — THE MAGNICATOR

NOW YOU CAN PERFORM the most difficult dial indicator tests quickly and positively — thanks to the Magnicator's exclusive design features. Simply press the "ON" button and a powerful permanent magnet anchors the base in any position — even on round surfaces! Press to "OFF", and the base is completely free . . . instantly! The compact, lightweight holding tool for hundreds of precision tests . . . even those impossible with "conventional" testing tools. Send for complete details. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island, U.S.A.

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VISIT BOOTH 520 AT THE MACHINE TOOL SHOW

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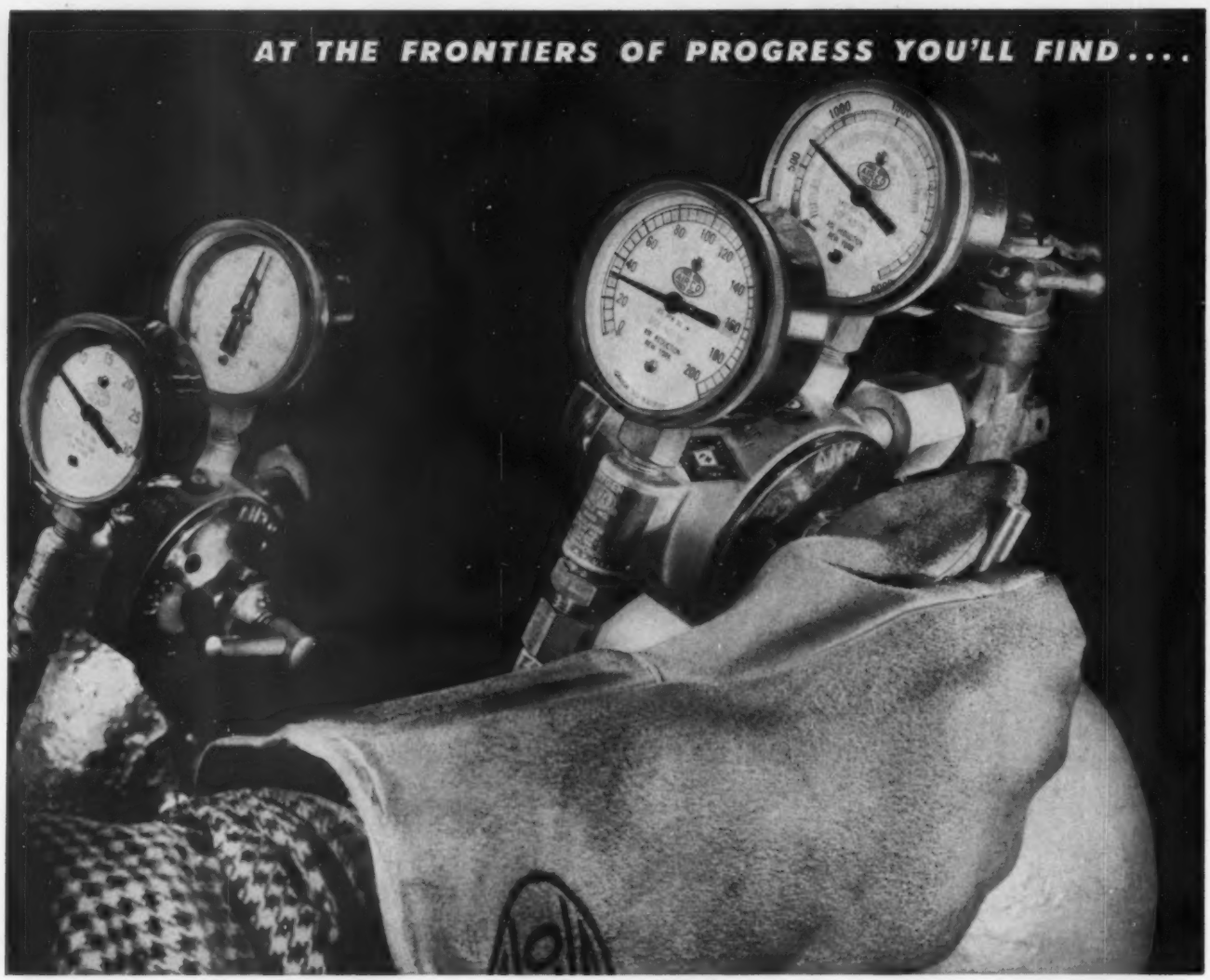

cut production time with AIRCO REGULATORS

that you set... and forget!

Airco two-stage regulators require but one adjustment . . . the first. Once set at the correct operating pressure they deliver a constant, nonfluctuating flow of gas from start to finish of cylinder discharge. Drops in pressure are automatically compensated for. Thus, an operator can devote his full attention and skill to the job at all times – speeding production – reducing costs.

Similarly Airco produces station regulators designed to operate on low-pressure pipe line systems which provide uniform gas pressures wherever required. Here, too, a single setting eliminates the necessity of frequent, time consuming readjustments.

Over two million Airco regulators have been purchased through the years. You'll discover that the inherent advantages of these Airco-engineered products make their initial cost a wise investment for long years of quality, trouble-free service. For detailed information and literature, contact your local Airco Representative, authorized dealer, or write Airco direct.

AIRCO®

AIR REDUCTION

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Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities

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Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide, liquid-solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl-acetates, — alcohols, and other synthetic resins.

AN AIR REDUCTION PRODUCT

AIRCO items
for cutting and welding

AIRCO OXYGEN – 99.5% pure for maximum speed, economy and efficiency in welding, cutting and other flame processes. Available in trailers in quantities up to 40,000 cubic feet, and in the standard 244 or 122 cubic foot cylinders.

AIRCO ACETYLENE—when burned with Airco oxygen gives an exceptionally high temperature flame (6300°F). This extreme heat makes it superior to all other fuel gases for welding and cutting. As in the case of oxygen, you are always assured of a convenient local supply when you deal with Airco.

AIRCO "45" and "45M" tips for faster machine gas cutting and narrower kerf. Available in 8 sizes for cutting metal up to 8 inches in thickness. Airco "45M" has some basic features of the "45" tip but is designed for heavier preheat and is particularly adapted to bevel cutting, cutting rusty and scaly steel, and cutting with hydrogen as a fuel gas.

The Airco line includes a wide variety of multiflame tips, flexible tubing and extensions to put the flame just where you need it. There are tips for flat descaling, flame heating, automatic silver brazing set-ups . . . also a tip that gives a paint brush type of flame that's perfect for small tubing. *Write for literature on these items.*

niques to new problems. For these reasons engineers working as shop foremen are ideally situated to form the nucleus of the new type of men prepared to move with confidence into the fast pace of tomorrow's manufacturing demands. And tomorrow is here today for many industries.

Any objections to the employment of engineers as foremen on the grounds of lack of supervisory and management techniques are superficial. Working supervisors can attend regular management conferences or training courses which provide education in new management techniques and in new technical skills. This training is provided by most forward-looking plants and is open to all foremen. Thus, newly-appointed engineer-foremen as well as oldtimers, are kept informed of latest developments and techniques.

It is true that the engineer-foreman may not have as good an understanding of human relations as the foreman who came up from the ranks in the shop. But he is peculiarly fitted by reason of training and knowledge to readily absorb new manpower methods and to adapt existing techniques of work and manufacture to new problems. He is an asset to any plant and should be enthusiastically received.

In my opinion the engineer-foreman is ideally suited for shop employment in interpreting complex blueprints, advising as to the proper method of making layouts for new or unusual work, and solving problems involving mathematical skill. Although the engineer may have to enter the production shop cold as far as shop experience is concerned, his engineering background and training will stand him in good stead

"And away you go . . . . ."

TEAR OUT AND MAIL!

YES! I would like to know more about

STAR-KIMBLE

Special Motor Designs

☐ If your sales engineer will give me a ring, I'd like to talk to him AND IN THE MEANTIME, you might send me your bulletin on Standard

☐ SQUIRREL CAGE
☐ BRAKEMOTORS
☐ WOUND ROTOR
☐ D-C MOTORS
Generators, M-G Sets

My name is _____

They call me a _____ *(title)*

At _____ *(company)*

_____ *(street address)*

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(city) *(zone)* *(state)*

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MOTOR DIVISION
Miehle Printing Press and Mfg. Co.
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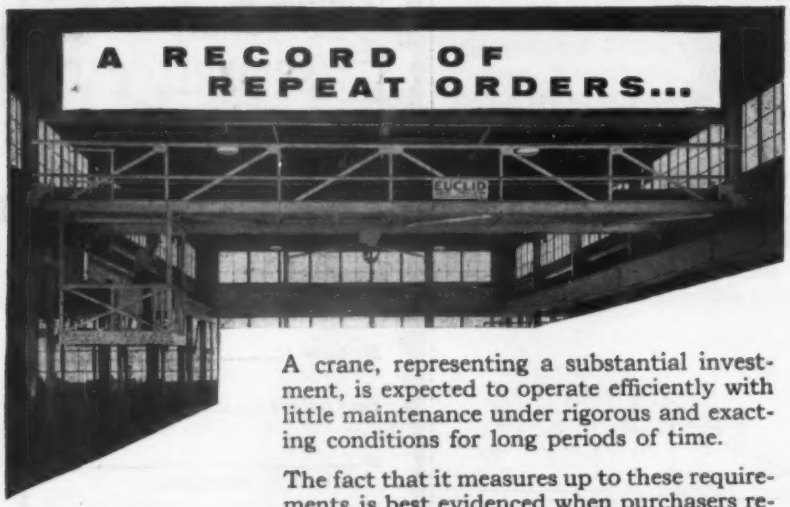
"I'll bet he's dreaming about his production with Columbia EXTRA Carbon Tool Steel."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS



A crane, representing a substantial investment, is expected to operate efficiently with little maintenance under rigorous and exacting conditions for long periods of time.

The fact that it measures up to these requirements is best evidenced when purchasers return to the same manufacturer when additional cranes are needed.

We are in a position to submit what we sincerely believe to be an unexcelled record of repeat orders as evidence of the continuing high quality and tangible value of Euclid Cranes.

THAT IS A STRONG ENDORSEMENT OF

Euclid Cranes

The EUCLID CRANE & HOIST Co.
1367 CHARDON ROAD
CLEVELAND 17, OHIO

in quickly absorbing the necessary shop knowledge.

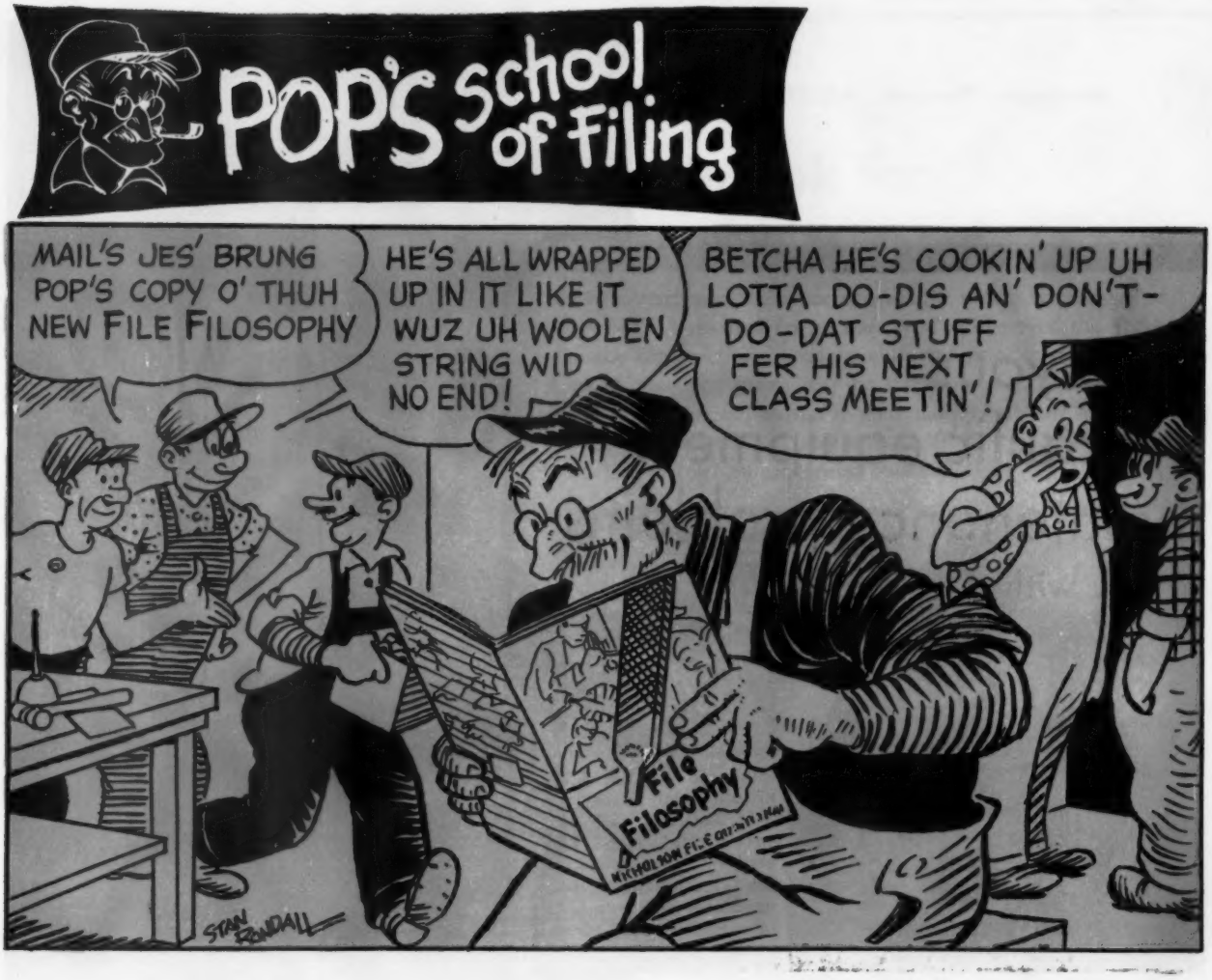
I've always been in favor of the desirability of introducing new ideas by bringing in persons of more varied experience or more recent training. I believe that bringing in an outsider, especially an engineer, for a foreman's job outweighs the values to be gained by promotion from within. Hiring an outsider recognizes the fact that a foreman's job involves many duties not generally associated with rank-and-file performance. New viewpoints are what a supervisory job needs.

Sure he doesn't have the experience of handling shop men but, on the other hand, he doesn't have to reorient his thinking that a present subordinate would have to do. It's harder to reorient the thinking of a present subordinate from an identification with his fellow-workers and their problems to management and its problems. It's easier to teach an outsider to think in terms of management. A man promoted from the ranks to foreman will not chance the coolness and perhaps real unfriendliness of fellow-workers by embracing wholeheartedly the management viewpoint. He is more likely to retain the worker ideology. A foreman promoted from the ranks considers the sentiments of his men, is friendly toward them. Identifying with his men tends to increase social distance toward his chief. Freer communication with his chief is reduced, for the foreman tries to cover up for his men, resists changes imposed from above, and modifies his orders to fit the local situation.

Of course there are some who would criticize the selection of the engineer as foreman. They say the foremanship obviously is merely a stepping stone for the young en-

(Continued on page 233)

"Okay! Okay! they laughed at Panama when he built his canal too!"


POP'S school of filing
MAIL'S JES' BRUNG POP'S COPY O' THUH NEW FILE FILOSOPHY
HE'S ALL WRAPPED UP IN IT LIKE IT WUZ UH WOOLEN STRING WID NO END!
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File Filosophy
STAN RANDALL

For many years Nicholson File Company's "File Filosophy" has been a master key to *lower filing costs, higher working efficiencies* and *increased mechanical efficiency.*

Now this most widely used manual on files and filing has been revised-and-polished with up-to-date changes and more pages—including an added chapter on selection and use of Rotary Files and Burs, of special interest to Industry.

With today's multiplicity of metals and alloys, accuracy and speed in production and assembly-line operations make the use of *The right file for the job* increasingly important.

Nicholson's wide range of job-tested Special Purpose files makes this book especially useful to production engineers and shop foremen, as well as to management and purchasing heads.

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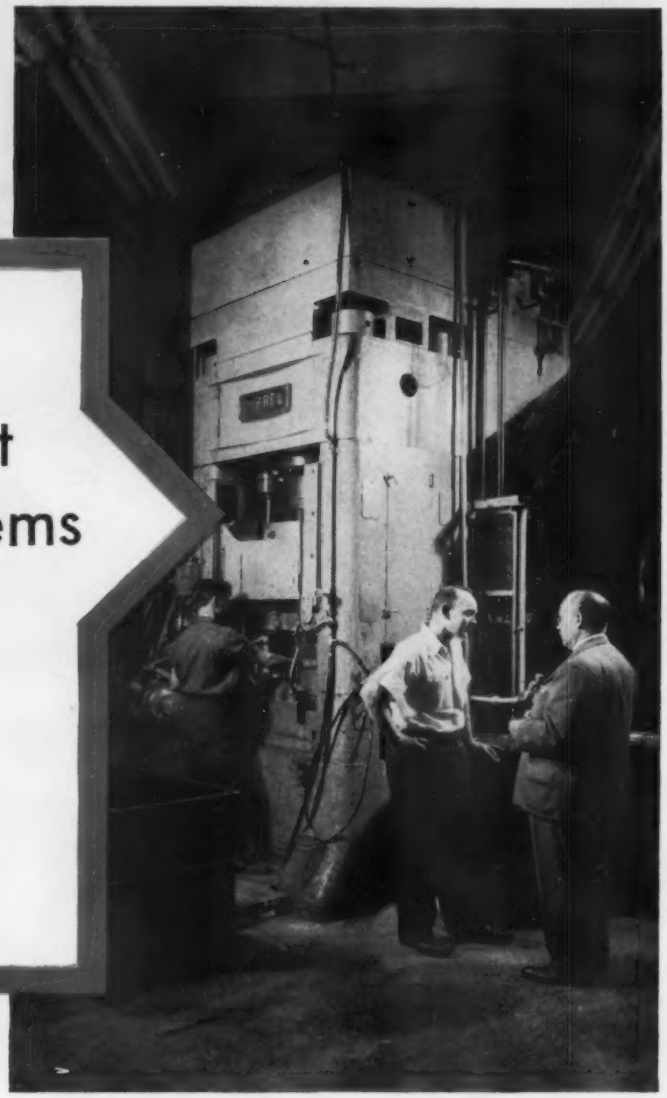
Address_____

ease your hydraulic equipment maintenance problems with GULF HARMONY OIL



Use a hydraulic oil that has excellent resistance to oxidation, high film strength, outstanding rust preventive and anti-foam properties—qualities which hydraulic engineers consider to be the most important when selecting a hydraulic lubricant —and you will have fewer maintenance problems and less down time.

Gulf Harmony Oil has all of these qualities. It prevents the formation of sludge deposits and maintains its original viscosity over long periods of time. It also protects hydraulic equipment against excessive wear, even under severe conditions of pressure, speed, and temperature. And it protects against the damaging effects of harmful rust.

So if you have maintenance problems with your hydraulic equipment, call in a Gulf Sales Engineer. He will recommend the right grade of trouble-preventing Gulf Harmony Oil for your equipment. Contact him today at your nearest Gulf office.

GULF OIL CORPORATION
1822 Gulf Building

GULF

GULF REFINING COMPANY
Pittsburgh 30, Pa.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

gineer. He came out of college with a lot of theory in his head, but not much practical knowledge. He has no knowledge of the habits and thinking of the men in the shop that a promoted shopman would undoubtedly possess. They argue that the young engineer will be here today and gone tomorrow, or as soon as a suitable engineering position becomes available. He's a white-collar man and white-collar engineering jobs have too much allure. Hardly anyone with a college degree wants to get his hands dirty or to work down in the shop. Sure it's wonderful training for the young engineer to put him into a foreman's job, but it makes for no permanency in the leadership of a group when the foreman is on the lookout to move on to his own field of engineering.

In one company I know of, a foreman job became vacant. An outside engineer was hired for the job instead of promotion of a shop man from the ranks. The company felt the engineer had the best qualifications, not only technically, but as a person. Although he had no previous training in the shop, he was selected because the company felt it could teach the man all the shop know-how he needed to know in six weeks, but it had taken him many years to become the person he was. It was felt that the foreman's job involved leadership as well as control of quality and costs. The engineer appeared to posses the personal abilities, aptitudes, and interests that were required for leadership. It was not a question of the engineer and his slide rule versus the qualified production man. It was a question of individuals, with their personal attributes.

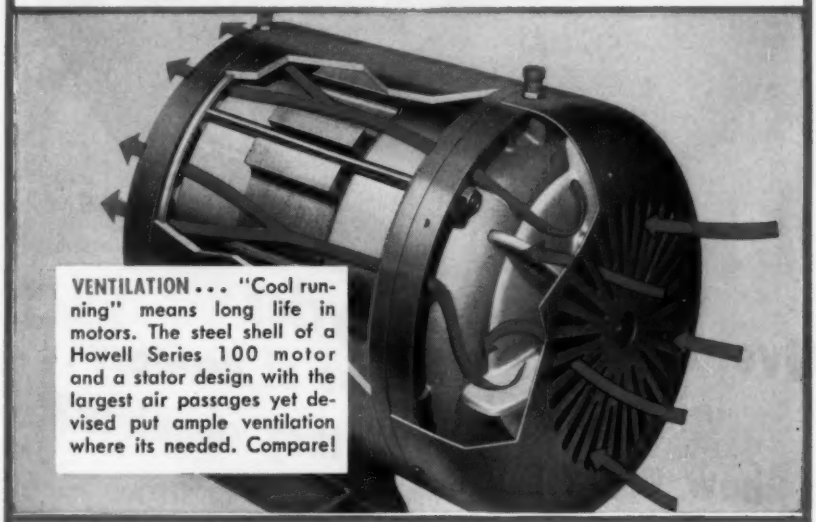
The engineer working as shop foreman is in an unique position to examine the product being manu-

"Figures awfully small on that blueprint, Hempwood?"

to MACHINE BUILDERS, Howell suggests

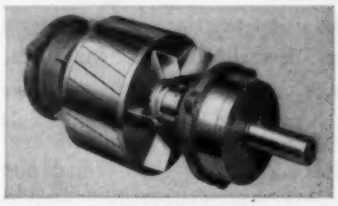
What to look for in the new re-rated motors

If you've investigated the space and weight saving advantages of the new NEMA re-rated frame sizes, you've observed the variation in the constructions motor manufacturers offer to meet the new standards. The prices may be the same . . . but why not insure that you get the most for your money? Below are some point for comparison . . . and a few of the reasons why the Howell "Series 100" motors are so outstanding!



VENTILATION . . . "Cool running" means long life in motors. The steel shell of a Howell Series 100 motor and a stator design with the largest air passages yet devised put ample ventilation where its needed. Compare!

BEARINGS They should be fully protected. Dirt can't enter Howell's cartridge-type, double shielded bearings either from inside or outside the motor. On TEFC motors, cartridge remains sealed when end plates are removed. Compare!



ALL-COPPER ROTORS Howell motors have all-copper rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet special requirements. Compare!

The new Howell Series 100 TEFC Motor

SMALLER • LIGHTER • COOLER • MORE STREAMLINED. TEFC and Open Drip-proof types have the same diameter . . . are completely interchangeable.

WRITE FOR THE SERIES 100 CATALOG

HOWELL MOTORS

Howell Electric Motors Company, Howell, Michigan

HOWELL Red Band MOTORS

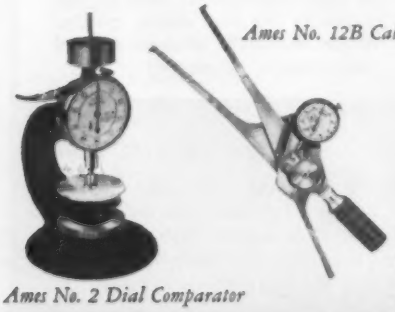
AMES

Over 16,000,000 cycles without wear or loss of accuracy . . . how many more will they complete?

Several Ames Long Range Dial Indicators *with plain bearings* are currently giving an amazing demonstration of performance and endurance under test. Several Model 282 Indicators, selected at random from our stock, still have their original accuracy—after more than 16,000,000 cycles each, at 240 strokes a minute, 9 hours a day.

This outstanding record is made possible by Ames' use of simple basic design, highest quality materials, rugged construction . . . and expert craftsmanship.

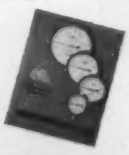
How many more cycles will these Ames indicators complete?



Ames No. 2 Dial Comparator

Ames No. 12B Caliper Gauge

Ames No. 552 Dial Micrometer



If you would like to have our recommendations on your measurement problem, send blueprints and specifications. And ask for your free copy of our catalog on Ames micrometer dial indicators and gauges.

Representatives in principal cities. B. C. AMES CO. 26 Ames Street Waltham 54, Mass.

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

factured to see if a change in design will result in better quality and a lowering of costs. He is also in a position to insure closer coordination between the product designers and the manufacturing people. This is worth money to any company in the stiff competitive era we now are in. We know how design affects methods of fabrication as to cost and productivity. The engineer-foreman has the proper background to intelligently have something to say to Design about the production aspect of the product that may lead to beneficial modifications. Any assistance by engineering-trained foremen to help in advancing more economical and producible design will surely lead to a better product. Since the product is the most important factor in any manufacturing organization, and the success or failure of the entire enterprise is dependent upon product acceptance and quality, the engineer as shop foreman can use his talents to the advantage of the company as well as the shop.

Harry Kaufman
Philadelphia, Pa

THE MODERN SHOP FOREMAN is a man of distinction. He occupies a position of great importance and is a factor of considerable significance in determining the degree of success of the organization. The foreman is not just a superior mechanic, he is a man of many abilities.

Parts and products are made by men, not by machines, for manufacturing dates back to before the age of machines. Machines are applied to the work to assist the men, to improve the quality and the quantity of output and to reduce effort required. The foreman is a director of men, not of machines, and man is a complex thinking creature of many

"I wonder what happened to that blabbermouth foreman . . . he was helping us crate this stuff."

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING

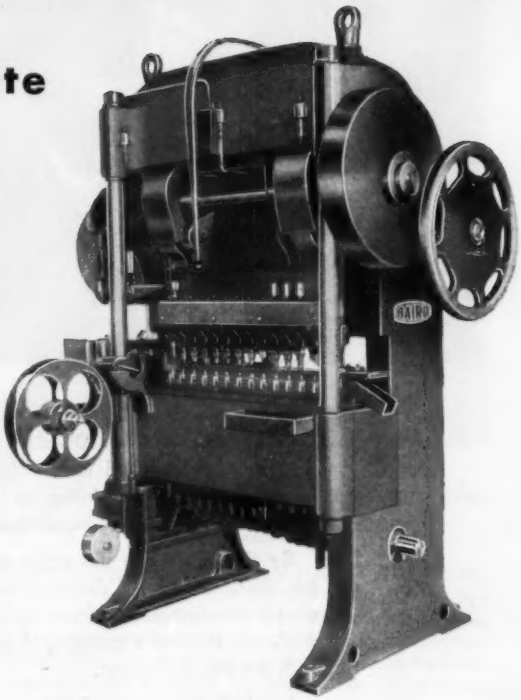
80 complete pieces per minute

FOR PROFITABLE PRODUCTION

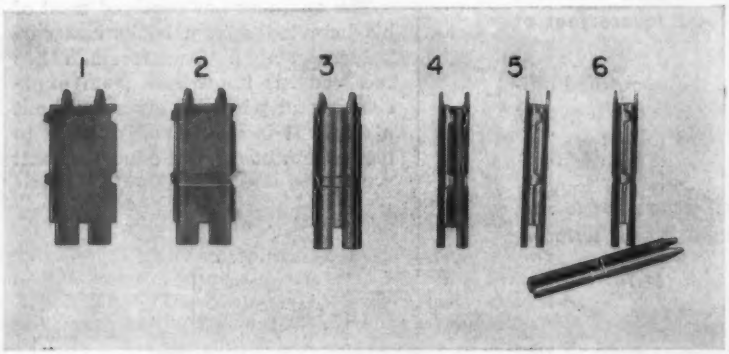
Here is low-cost, completely automatic production . . . typical of precision stamping that can be performed on the Baird Multiple Transfer Press.

For complicated work, with punch holders and die blocks . . . transfer slides and fingers . . . progressive operations through 14 stations, might include blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, inserting, and riveting. And tooling is easily replaceable for the work required.

There are 12 press sizes, taking automatically-fed coiled stock from 2½" to 4"; maximum feed length from 2" to 3½". For low-cost, volume production within its range, there's no more profitable automatic than the Baird Transfer Press. Bulletin on request. Write Dept. A.M.



BAIRD AUTOMATIC TRANSFER PRESS



Producing an electrical switch part

Here is a hollow shaft, used in an electrical switch, that is produced completely in a 6-station die set. At station No. 1, the part is blanked from flat stock. At No. 2, the outer edges are curled . . . and the remainder of the forming operations take place at stations No. 3, 4 and 5. Final sizing is performed at No. 6. This shaft is made in different lengths and variations, by means of interchangeable punches and dies. Production, 80 pieces per minute . . . 4800 per hour.

Write Dept. A.M.

4BA53

the BAIRD MACHINE COMPANY

STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

● When Studebaker Division, Studebaker-Packard Corporation switched to Ransburg No. 2 Process of Electrostatic Spray painting on their automobile chassis, paint mileage was increased 9 times.

By simply putting the paint where it's supposed to go, Studebaker cut daily paint consumption on the chassis production line from 14½ drums to 1½ drums. And, still they are painting 6 more chassis per hour with the No. 2 Process.

In addition to getting better, more uniform coverage with the asphalt-type coating, paint and labor costs were cut 70¢ per chassis. In eliminating the former set-up with 2 water wash booths and 12 automatic spray guns, they save nearly 1000 square feet of badly needed floor space.

Another on-the-job-example of the unmatched efficiency of the Ransburg No. 2 Process in which quality of the work is improved . . . AT LESS COST!

**Studebaker also uses the Ransburg method to apply a heavier and more uniform primer surfacer on automobile bodies.*

Whatever your product—large or small—if your production justifies conveyorized painting, it's possible that one of the Ransburg electrostatic processes can do the job better, with substantial savings to you. We'll be glad to tell you about complete Ransburg services.

Write to Dept. A.M.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana
RANSBURG

moods and facets. Handling a complex machine is a simple chore when compared to handling people.

Does the engineer know how to handle people? He may, if he has had the necessary experience. The foreman who has come up through the ranks knows exactly how the men in the shop feel toward their job and their foreman. He knows not because he has been told about it, or read about it, but because he has lived it. He knows their motives and their feelings, their intentions, and their objectives. A man who has come up through the ranks has a much better chance of being successful as a foreman because he is more readily accepted by the men. The men are distrustful of an engineer who has stepped into the position of foreman.

In addition to knowing men, the good foreman must know machines, materials, and methods. He must have an intimate knowledge of the methods and he must have that all-important feeling for and acquaintance with the materials of his trade. He must know what he can do with them and how they will react to the forces he applies and the operations he subjects them to.

The machine builders are constantly changing their machines and developing new ones. The foreman does not have to know how to run every machine ever built as long as he has good mechanical perception, and can look over a machine and quickly learn to operate it. He has lived with machines for many years and becomes acquainted quickly with a new machine following a short introduction.

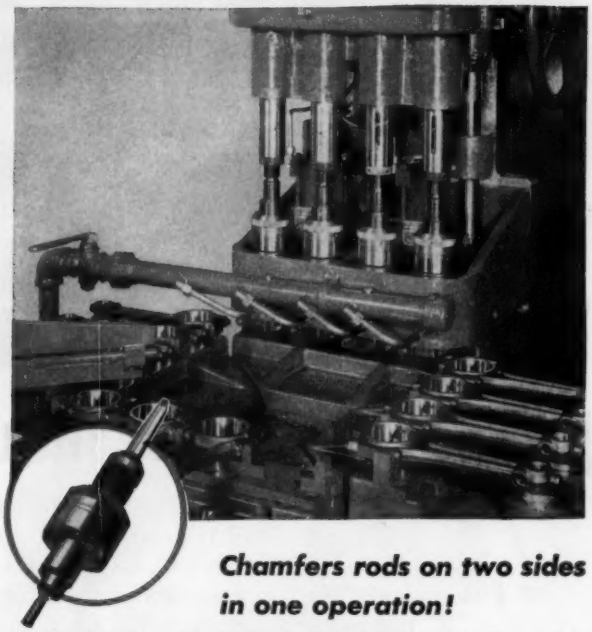
The engineer has received most of his knowledge from books and verbal instruction. The foreman has received his know-how from experience, and trial and error. Without a doubt it is easier and quicker to learn from books, but educators will

SCULLY JONES

"Precision Holding" Tools bring you cost-cutting benefits for tapping, chamfering, milling!

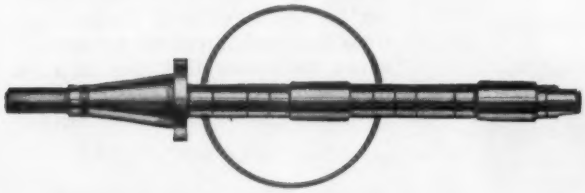
New Safe-Torque Tap Driver reduces tap breakage up to 100%

At Caterpillar Tractor Co., Scully-Jones Safe-Torque Tap Drivers made possible a 25% cost reduction, 10-12% manpower saving, 5% production increase, and 400% increase in tap life. You can save, too, by controlling adverse tapping conditions with this new adjustable Tap Driver because it releases instantly and completely when torque reaches the danger point. *Write for Bulletin 20-50.*



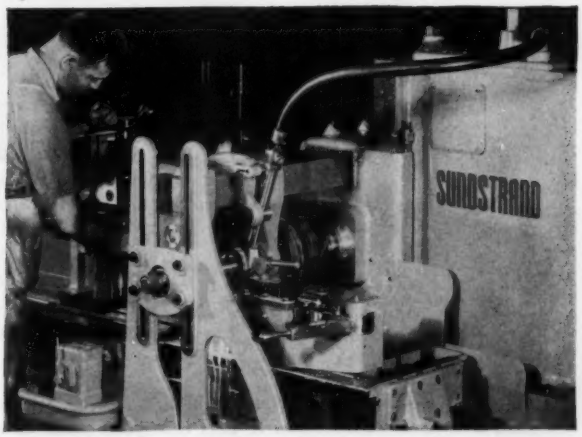
Chamfers rods on two sides in one operation!

At Studebaker Corp., Scully-Jones Automatic Recessing Tools prove their accuracy and speed. Each cycle they produce two chamfers in four connecting rod bores. The position of cutters for location and depth of cut is controlled within .001". Perhaps you have similar operations you can combine and simplify by using these *Automatic* Recessing Tools. *Write for Bulletin 10-50.*



Rugged Arbors assure long tool life at high speeds!

Rigidity of machine and tooling *is a must* for gang-milling these tough steel forgings . . . 46 per hour! Sundstrand specified Scully-Jones Style "B" Milling Arbors because they're tough and *precision built* to run true during fast, heavy cuts. Take the gamble out of milling with Scully-Jones Arbors and Adapters. *Write for Bulletin 2-50.*

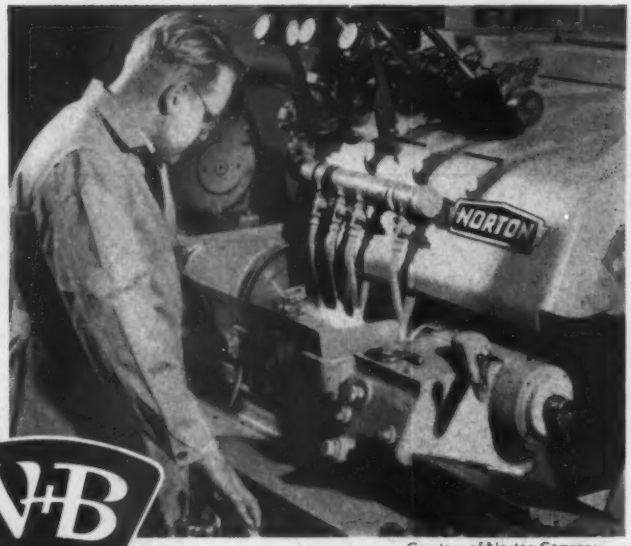


SCULLY-JONES AND COMPANY, 1902 S. ROCKWELL ST., CHICAGO 8, ILL.

SCULLY-JONES

"Precision Holding" for holding precision

Call Scully-Jones local representative or distributor—factory-trained "Precision Tool and Work Holding Specialist"—for complete information and service.



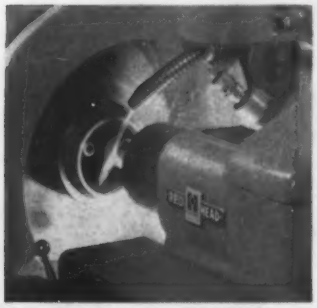
Courtesy of Norton Company

W+B
INDUSTRIAL LUBRICANTS

CHOICE OF THE LEADERS

For 60 Years the top production engineers of the country . . . cost-conscious and production-wise . . . have been coming to W & B saying: "We use a variety of grinding and cutting oils in big quantities. We could cut costs and at the same time reduce our inventory of ready-mixed oils, *if* we could get a versatile concentrated base to mix with our oils in the right proportions for various types of work."

W & B Has Always Delivered for this all-important reason: We have been specialists in the development and application of lubricants for metalworking since 1888.



For example, widely-used W & B Base L, a comparatively light-bodied sulphurized fatty base, is a concentrate used to blend or fortify a wide range of metalworking lubricants for machining, grinding, drawing. W & B Base L mixes quickly and easily with petroleum oils in all proportions to provide efficient metalworking oils at low cost.

Do *you* have a metalworking problem? Ask us, without obligation, to send a W & B Lubrication Expert into your plant to consult with you.

THE WHITE & BAGLEY CO.

Established 1888

Worcester Detroit

readily admit that such knowledge is weak and incomplete. To really know something, be it a tool, or a machine, or a process, it must become part of oneself. The books will tell you what the machines can do —only experience can tell you what they cannot do. The engineer is in the same position as the novice who has just been given instructions for finding his way through the woods. Once he gets off the trail his instructions no longer apply; he is lost, and does not know which way to turn.

It is well and good for the engineer to have studied tables of cutting speeds and feeds, for turning and drilling etc, and wheel grades and hardness for grinding. However, all these reference tables have one thing in common—they are all prepared as a guide only, and most tables carry a note to this effect. In each case there are many other factors to be considered—rigidity of the work, type of jig, condition of the machine, etc. This is where experience pays off. The man who has never broken a drill or toolbit can be sure of just one thing—he is not forcing it too hard. He does not know if he is getting all he can out of it. He will never know just how hard he can force a drill until he has broken a few.

Schools are aware of the shortcomings of learning from books, and realize the value of experience. The high-school chemistry instructor will explain in great detail how a glowing ember will burst in flame when it is placed in a jar of oxygen. This is not too difficult to comprehend, yet he will have each student perform the experiment for himself because he knows that this is a far more effective way of learning. It would be ridiculous to expect a per-

For LARGE HOLES in TOUGH METALS *you need a . . .*

BAUSH HEAVY DUTY DRILL

. . . just as one large engine maker has selected the Baush Vertical W8 Hydraulic Multi-Spindle Drill illustrated for drilling, core drilling and reaming heavy diesel motor cylinder heads.

The experience and know-how of Baush, gained through more than 60 years of building equipment with a reputation for sturdiness, long life and extremely low "down time," is exemplified in such a unit.

Designed to operate with a 4-position sliding fixture this machine drills 16 holes from 21/32" dia. to 1½" dia., as well as core drilling 12 holes from 1-5/32" to 1½" dia. and reaming 2 holes to .871; making a total of 30 slip-sleeve spindles with nose adjustment incorporated in a special head 28" x 54" of the adjustable joint driven type, with master bored cluster plate.

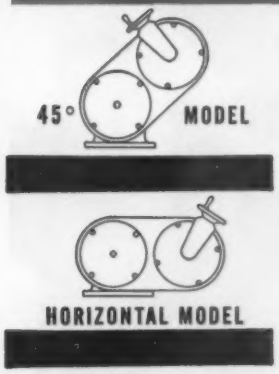
30 H.P. 1800 R.P.M. spindle motor arranged for Texrope drive furnishes drilling power and a 7½" H.P. 1800 R.P.M. motor drives hydraulic pump.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Why not send us your heavy duty machine problems TODAY — our engineers will gladly work out your operations to give maximum production with lowest operating, as well as maintenance cost.

REEVES

Fractional HP Motodrive



NEWEST DESIGN FOR VARIABLE SPEED 112 ASSEMBLIES

to choose from— engineered to your exact requirements!

CHECK ALL THESE NEW, REEVES FEATURES

1. New redesigned, more compact drive gives you speeds from 3 to 4660 RPM . . . speed ranges from 10 to 1!
2. New "all-position," 14-turn handwheel gives operator sensitive, minutely-accurate speed control from a position most convenient for the installation!
3. New "all-position" output shaft permits driving in any direction—horizontal or vertical down!
4. New spiral groove lubrication with exclusive overflow outlet provides complete lubrication of all sliding surfaces for trouble-free operation at all times!

REEVES PULLEY COMPANY · COLUMBUS, INDIANA
Division of Reliance Electric and Engineering Co.

Send Today for Complete Information!
Specify Bulletin A7b-M543.

son to be able to play the piano just because he listened to lectures.

If the engineer is fortunate enough to have had sufficient experience to become fully acquainted with the men, machines, and methods of his trade and knows their possibilities and their limitations, then he has a chance to succeed as a shop foreman. If he lacks any of this knowledge he will find it a difficult task.

William Sinscowski
Woodside, NY

Names in the News . . .

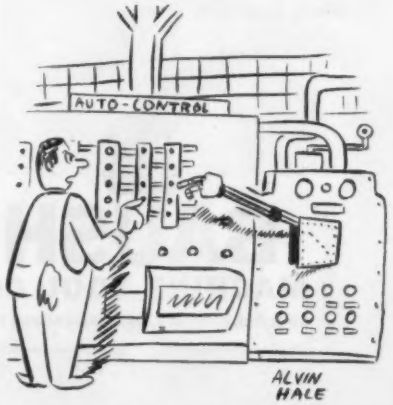
William F Burrows, in charge of White Motor Co's diesel activities, has been appointed general manager of the company's new Diesel Engine Division in Springfield, Ohio.

Russell Powell, general sales manager of Hydraulic Press Manufacturing Co, Mt Gilead, Ohio, has resigned to accept a sales post with National Automatic Tool Co, Richmond, Ind.

James F Healey has been appointed to the technical staff of Aro Equipment Corp, Bryan, Ohio. He will be in charge of a new program covering precision instruments applicable to guided missiles and pilotless aircraft.

Cecil Latham, general foreman of Robertshaw-Fulton Controls Co's Fulton Sylphon Division, Knoxville, Tenn, has been promoted to the post of assistant superintendent.

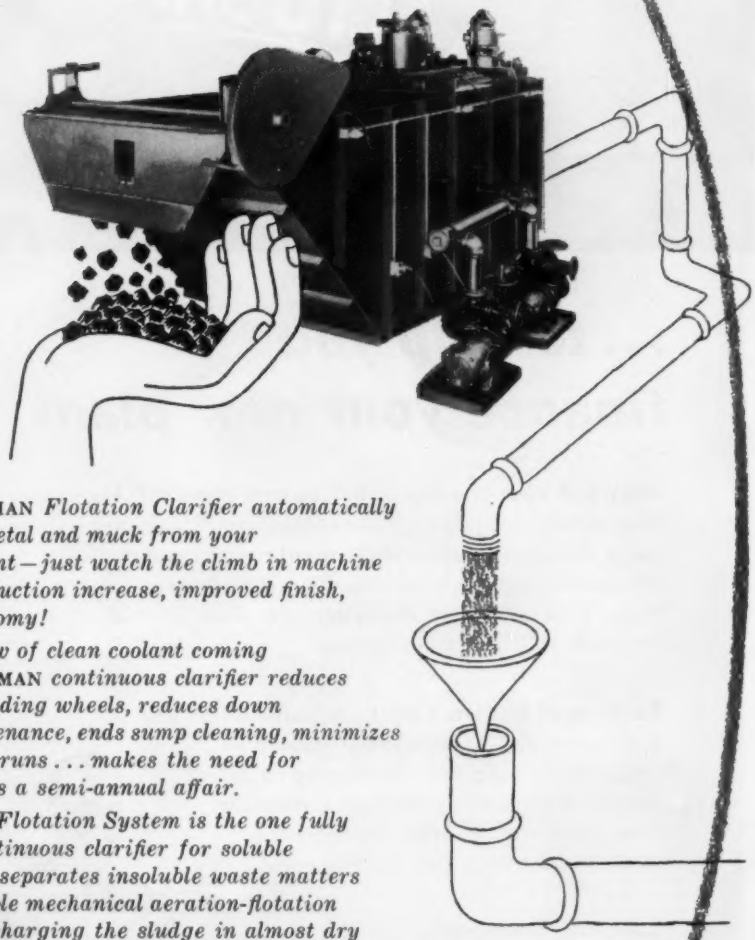
Lake Erie Engineering Corp, (Buffalo, NY) appointments: **E M Detwiler,** general superintendent, to works manager; **William H Bennett,** formerly of Hydraulic Press Manufacturing Co, Mt Gilead, Ohio, to sales manager; **Robert J Fuller,** as-



"I'll push the buttons around here if you don't mind!"

oil mining . . .

that means **better grinding!**



When a HOFFMAN *Flotation Clarifier automatically removes the metal and muck from your grinding coolant—just watch the climb in machine efficiency, production increase, improved finish, and labor economy!*

The steady flow of clean coolant coming from the HOFFMAN *continuous clarifier reduces loading of grinding wheels, reduces down time for maintenance, ends sump cleaning, minimizes rejects and re-runs . . . makes the need for coolant changes a semi-annual affair.*

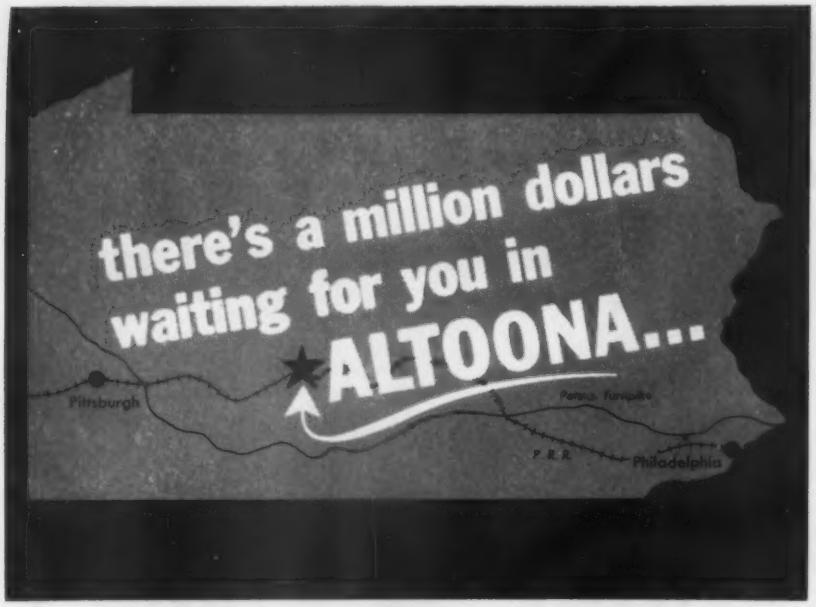
The HOFFMAN *Flotation System is the one fully automatic, continuous clarifier for soluble oil coolants. It separates insoluble waste matters through a simple mechanical aeration-flotation procedure, discharging the sludge in almost dry form. Users' records show how direct savings write off the cost in short order . . . write for actual case histories.*

Standard HOFFMAN *Flotation Clarifiers are built with flow rates from 20 to 1500* GPM, *with larger units designed to your requirements. Let* HOFFMAN *engineers show the advantages of the Flotation Clarifier in your operations. Write or wire—*

Industrial Filtration Division

U. S. HOFFMAN MACHINERY CORP.

DEPT. AM, 105 FOURTH AVENUE,
NEW YORK 3, N. Y.



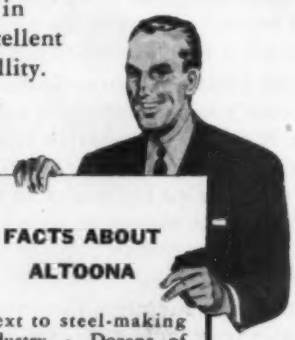
...to help you finance your new plant

Why put your money in bricks and mortar? Altoona Enterprises, Inc., an experienced community agency, has a non-profit *million dollar* fund to help you obtain desirable new factory space on a lease or sale basis. Take advantage. Get your new plant at *non-profit* rental or amortization!

Surplus of Skilled Labor—Altoona offers you 8,000 men and 3,000 women trained in mechanical skills and boasting an excellent record of efficiency and labor tranquillity. One metal firm, recently located here, had 4,000 applications for 100 jobs!

Mainline Transportation—Altoona is right on the PRR mainline. Excellent motor trucking facilities are available. The famous Pennsylvania Turnpike is just thirty miles away!

Write Dept. AM-5 or phone ALtoona 3-8151 in confidence.



FACTS ABOUT ALTOONA

Next to steel-making industry • Dozens of sites with utilities, railroad sidings • Vocational training in 11 skills • Adequate, modern housing • Home of SKF, National Radiator, Sylvania, Butcher & Hart and many others.

ALTOONA Chamber of Commerce
Altoona, Pennsylvania

sistant treasurer; and **Robert W Gerhardt,** also of H-P-M, to sales project engineer for the company's line of diecasting machines.

Sumner Ladd, factory sales engineer for General Controls Co, Glendale, Calif, has been appointed manager of the company's Industrial Controls Division.

General Motors Buick-Oldsmobile-Pontiac Assembly Division assignments: **Kenneth N Scott** named manager of the Southern California plant at South Gate, succeeding **H L Clark,** on leave of absence; **Robert J Hammond** succeeds Mr Scott as manager of the Arlington, Texas, plant; **Joseph C Christy** appointed production manager of the Southern California plant, succeeding **E L Christopher,** placed on special assignments; **H F Settle** named production manager at Arlington, succeeding **Richard J Howlett,** appointed production manager of the Atlanta, Ga, facility, succeeding Mr Hammond.

Lee H D Baker has resigned from Admiral Corp as vice president in charge of appliances. He will continue as a special consultant.

William E Smith, associated with the Mitchell Manufacturing Co, Chicago, for the past nine years has been elected vice president in charge of purchasing for the air conditioner, radio and television receiver manufacturer.

Gordon A Sommer, chief engineer of Clearing Machine Corp's Hamilton, Ohio, plant, has been named to head a new department created for research into techniques of pressworking metals and development of equipment for improved efficiency in metalworking.

Jack L Modrich, specialist on the adaptation of hydraulic and air cylinders to automation problems, has been named executive vice president of the Hydro-Line Manufacturing Co, Rockford, Ill.

George A Hinckley, sales manager of Automatic Transportation Co's (Chicago) line of rider trucks, has been named general sales manager of the company.

Fred E Harrell, formerly vice president, manufacturing, of Reliance Electric & Manufacturing Co, has been named general manager of Marquette Metal Products Co, Division of Curtiss-Wright Corp in Cleveland, succeeding **H Gleitz,** retiring after 35 years as head of the firm.

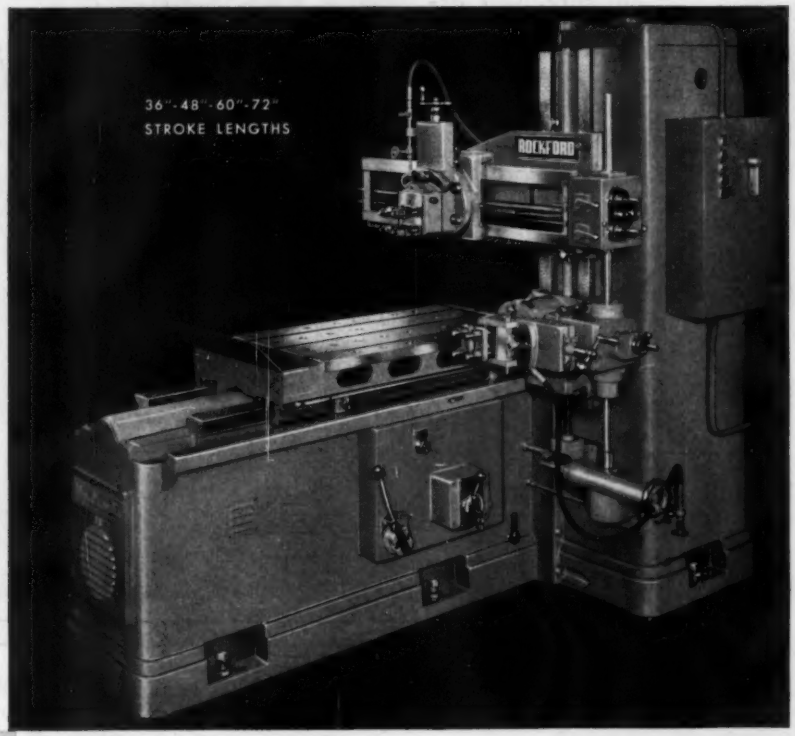
HYDRAULIC

fast, economical production calls for

HYDRAULIC

hydraulic openside shapers

HYDRAULIC



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Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Openside Shapers reciprocate the work instead of the tool and produce planer accuracy with shaper speed. When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

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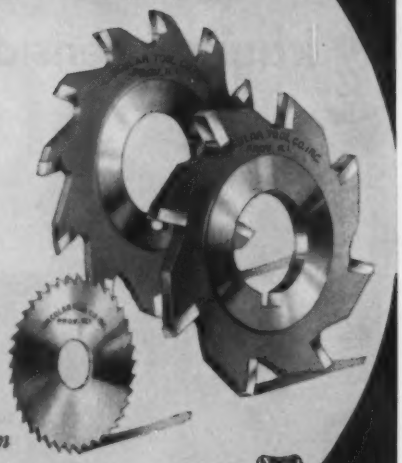

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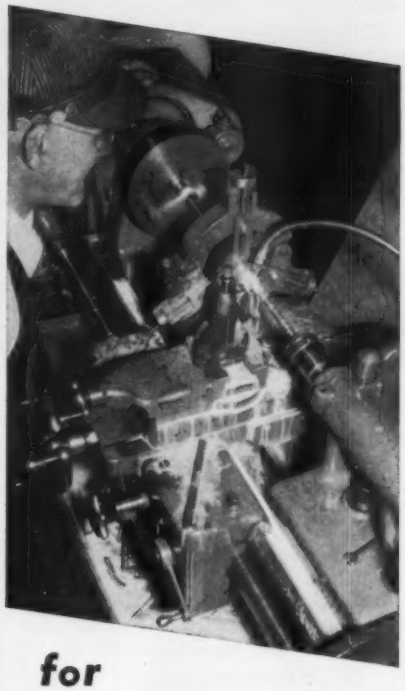
14½" LATHES



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MACHINING

South Bend 14-1/2" Lathes offer many advantages for precision machining. Ease of operation, speed, power, accuracy, and efficiency are some of the features responsible for their popularity. Often the precision and quality of finish obtained with South Bend Lathes are such that subsequent grinding, honing, or lapping operations are unnecessary. Substantial savings in capital investment, power consumption, floor space, and labor costs have resulted from their installation.

Write for catalog on 14-1/2" Lathes. Also 9" to 16-24" Lathes, 7" Bench Shapers, 14" Drill Presses and 8" or 10" Pedestal Grinders.

SPECIFICATIONS

Swing — 14½" over bed and saddle wings
Center Distances — 24½" to 60½"
Collet Capacity — 1"
Spindle Speeds — 8, 30 to 875 r.p.m.
Power Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841"
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Thread Cutting — 48 R.H. or L.H. pitches, 4 to 224 per inch

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Building Better Tools Since 1906

SOUTH BEND LATHES

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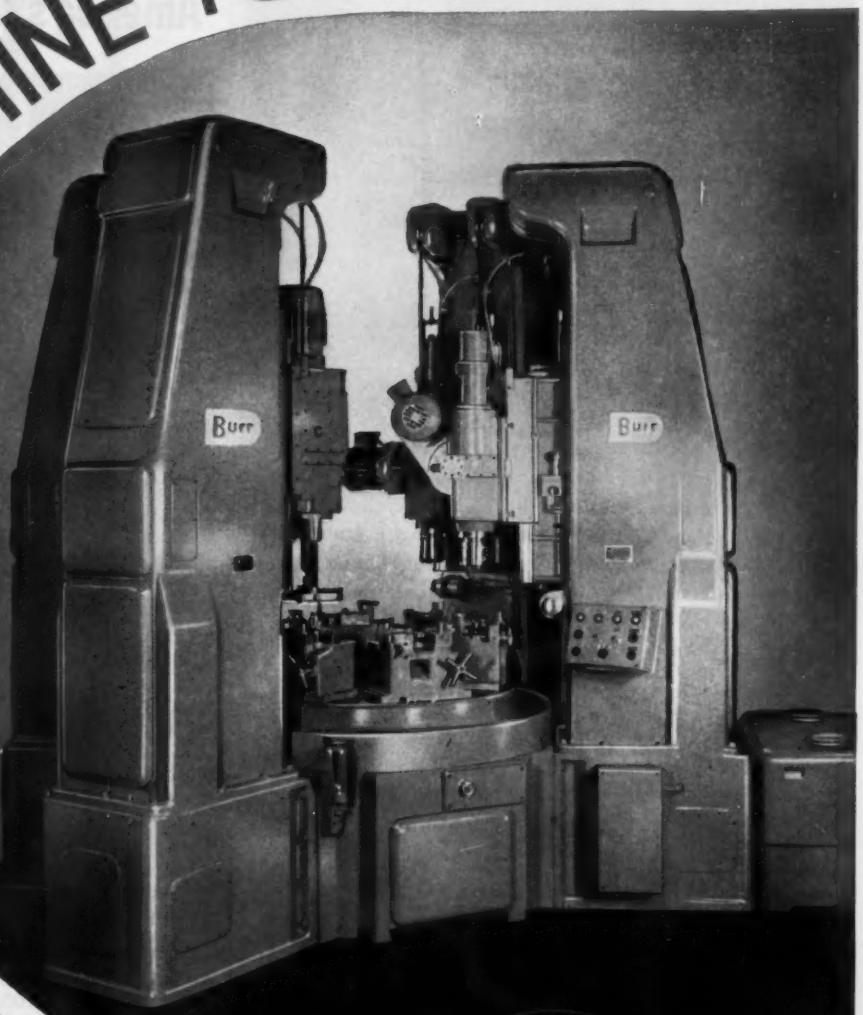
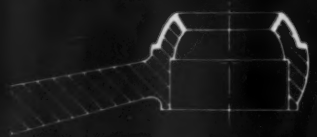


Hydraulic circular-table machine indexing table diameter 1200 mm (appr. 49") for taper boring and taper turning steering arms.



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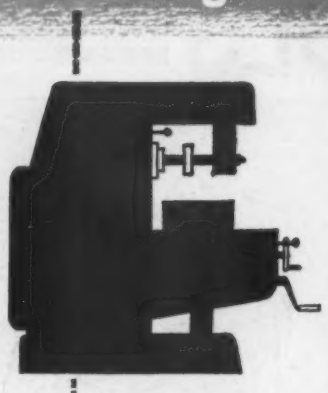

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How miller welders helped seal the arteries of America's largest single purpose power plant...

Substantial monument to Free Enterprise is OVEC and IKEC, suppliers of electric power to the Atomic Energy Commission's new uranium diffusion center in Pike County, Ohio.

Ohio Valley Electric Corporation and its subsidiary, Indiana-Kentucky Electric Corporation, agreed to supply electric power to this great new atomic production center . . . *15 billion kilowatt-hours annually.*

Two huge generating stations are being built: The Kyger Creek Plant at Cheshire, Ohio will have five generating units of 200,000 KW each; Madison, Indiana's Clifty Creek plant will produce 1,200,000 KW with its six big generators. Each of the eleven turbo-generating units will operate off a single boiler, with super-heated steam reaching 1,050 degrees Fahrenheit under 2,000 lbs. pressure per square inch! The high temperatures and reheat, which the sponsor companies have pioneered in their own right, will make these two plants among the most economical, most efficient generating stations in the country.

Miller Selenium Rectifier d-c Arc Welder, in four wide-range models. For complete, concise, worthwhile information on these and other Miller Arc and Spot Welders, contact us today . . . at no obligation, of course.

These same elements, however, make the fabrication of faultless high-pressure steam lines vital . . . and extremely difficult. To accomplish this extremely important task, pipe welding specialists equipped with the maximum of engineering skill utilized the Miller Selenium Rectifier d-c Arc Welder.

". . . . if it's Miller, you *know* it's the *finest!*"

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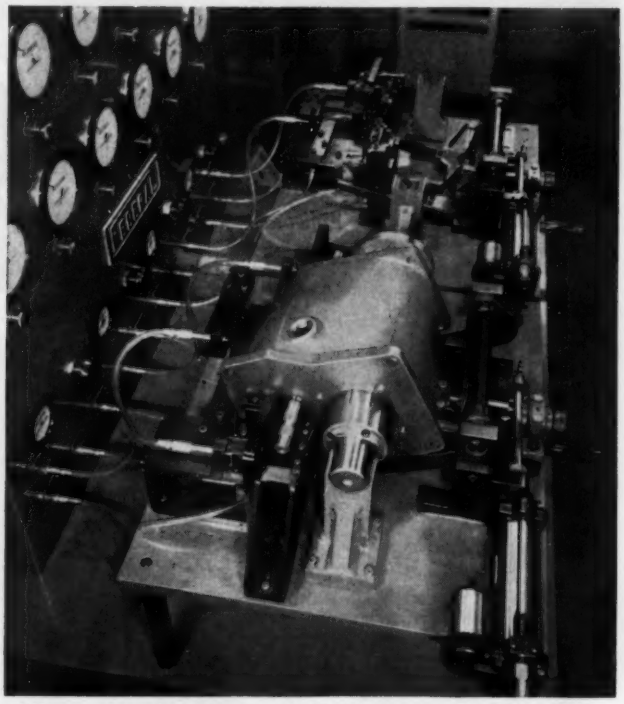
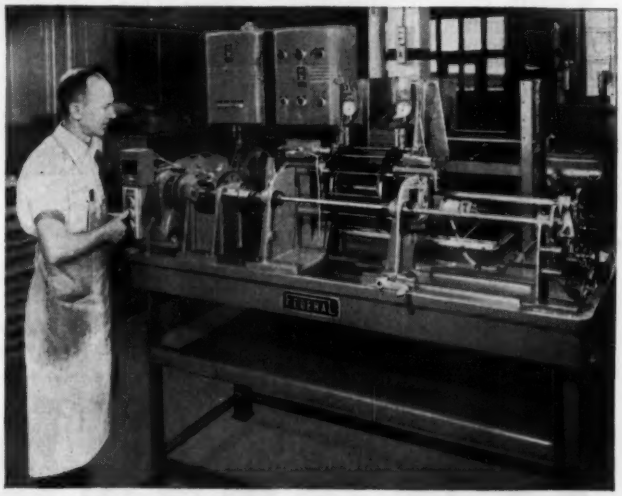


We can furnish equipment to check any number of dimensions simultaneously by any basic gaging method — whichever is best suited to the job.

OR We can go the whole way to "Push Button" in-process control. Shown here is one of a group of gages installed in a transfer or in-process production line.



FEDERAL has a wealth of experience in meeting the requirements of modern Automation. From a most complete line of individual dimensional indicating gages to standardized package units for air, electrical, electronic or combination machine controls, we can provide any degree of Automation you desire. Our engineers will gladly cooperate in adapting these to your requirements.

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ECONOMY *Automatic* POINTING MACHINES *for bolt and cap screw pointing*

TYPE 4600

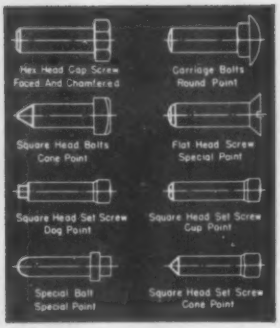
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

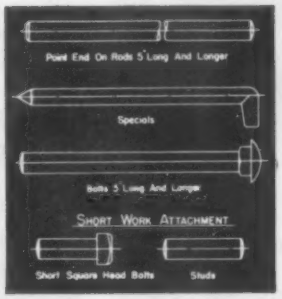
Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.


Hex Head Cap Screw Faced And Chamfered
Carriage Bolts Round Point
Square Head Bolts Cone Point
Flat Head Screw Special Point
Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Special Bolt Special Point
Square Head Set Screw Cone Point

Typical parts machined on the TYPE 4600



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines
Automatic Pointing & Threading Machines
Double End Automatic Pointing Machines

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Swaging • Grooving • Double Lap Flaring and Flanging Tubing of all materials from ⅛" to 4½" diameter.

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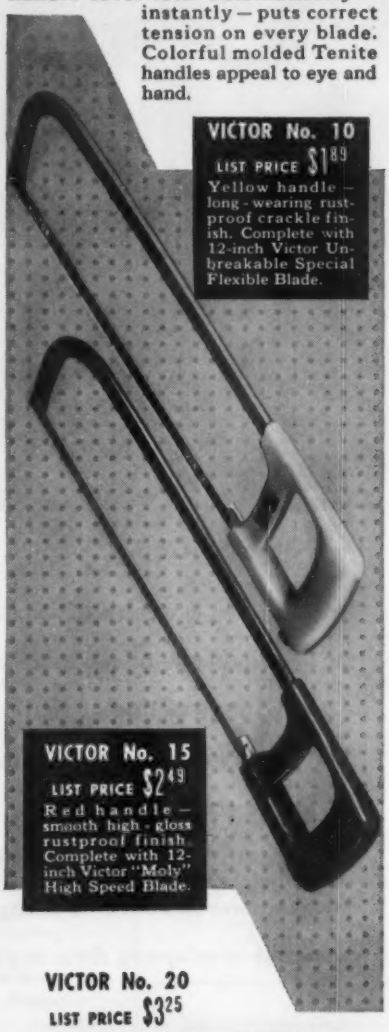
2 new frames

COLORFUL FUNCTIONAL DESIGN

The new Victor No. 10 and No. 15 frames fit either 10-inch or 12-inch blades, yet are built around a solid, one-piece steel backbone, the most rigid construction ever devised. New under-the-handle lever-lock automatically — instantly — puts correct tension on every blade. Colorful molded Tenite handles appeal to eye and hand.



VICTOR No. 10
LIST PRICE $1.89
Yellow handle — long-wearing rust-proof crackle finish. Complete with 12-inch Victor Unbreakable Special Flexible Blade.

VICTOR No. 15
LIST PRICE $2.49
Red handle — smooth high-gloss rustproof finish. Complete with 12-inch Victor "Moly" High Speed Blade.

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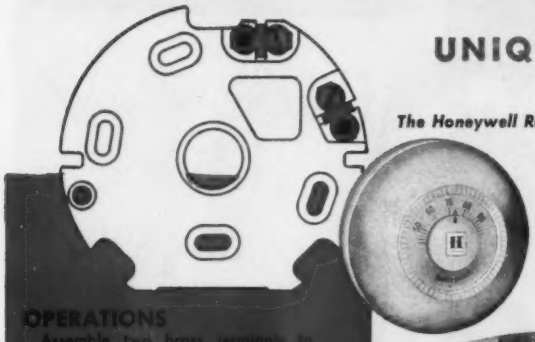
Bodine CASE HISTORY NO. 40

UNIQUE TOOLING SAVES 90% LABOR



The Honeywell Round

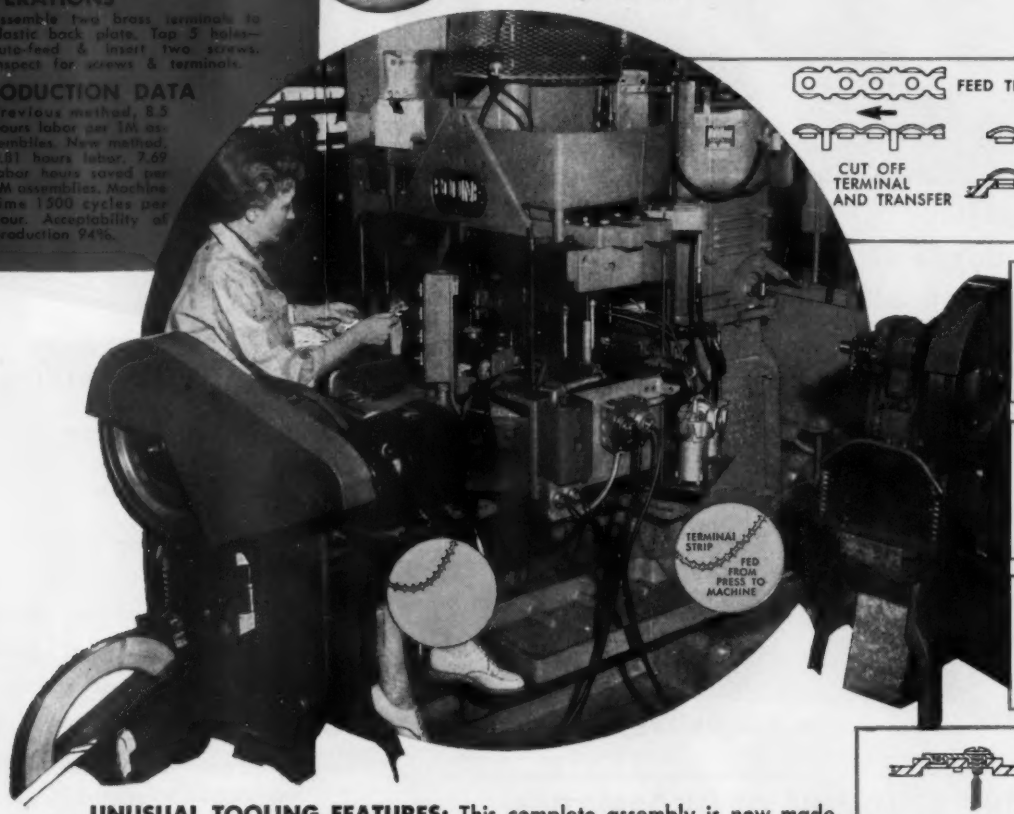
OPERATIONS

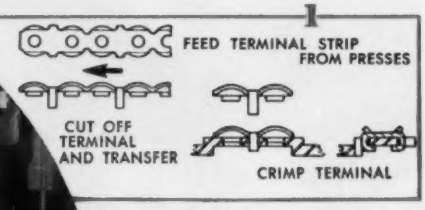
Assemble two brass terminals to plastic back plate. Tap 5 holes—auto-feed & insert two screws. Inspect for screws & terminals.

PRODUCTION DATA

Previous method, 8.5 hours labor per 1M assemblies. New method, 0.81 hours labor. 7.69 labor hours saved per 1M assemblies. Machine time 1500 cycles per hour. Acceptability of production 94%.

Minneapolis-Honeywell's attractive room thermostat depends upon this unique tooling set-up for economical volume production of the plastic back plate terminal block assembly shown at left. Labor hours have been reduced to about ONE TENTH of previous operations, thanks to this Bodine 42-30 Machine. It's just one example of the versatility of Bodine machines as they lend themselves for special tooling to meet specific job requirements.





UNUSUAL TOOLING FEATURES: This complete assembly is now made in one cycle of a Bodine 42-30 Machine. The two presses stamping the terminal blanks are coupled to and cycled by the machine, feeding stampings continuously as shown. Terminals are cut-off, inserted and formed over at station one. Back plates are magazine fed. Operator's functions are largely limited to keeping back plate magazine filled and replenishing coils of brass stock on presses.

At end of operation, two inspection probes, advanced from below, test for properly filled screw terminal holes, automatically discard rejects.

With today's demand for cost-saving through grouping of assembly operations, Bodine's extensive experience in the field will prove profitably useful. We invite inquiries. Send your ideas and samples for analysis to Dept. AM-5.

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THE Bodine CORPORATION
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AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

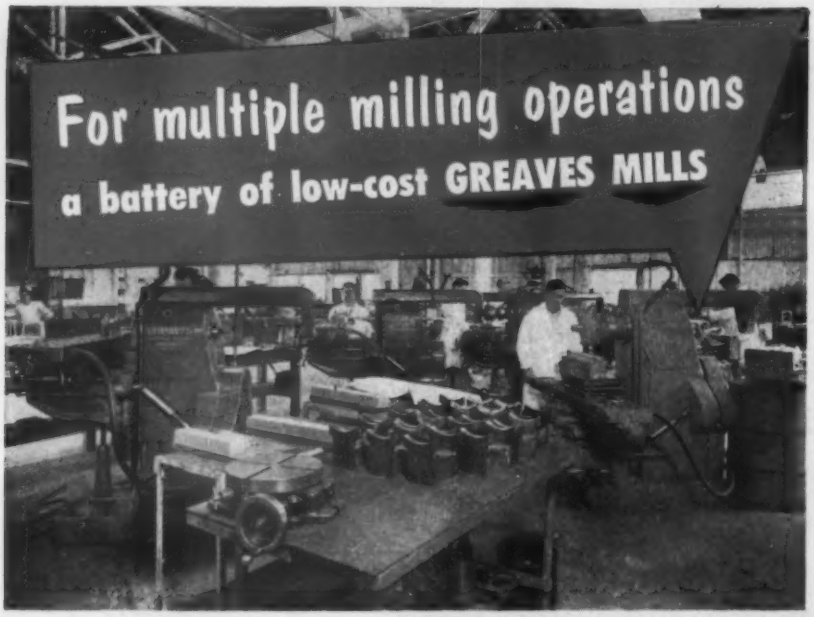

Photo courtesy of Mendelson McCarthy Co., Long Beach, Cal.

multiple mills speed production, save set-up time!

When you get 5 milling machines for the usual price of 2 or 3 . . . set up "production line milling" that's easily adapted to an extremely wide range of parts . . . you also get important savings! So reports an aircraft parts plant that installed 5 GREAVES MILLS, saved capital investment, production and set-up time!

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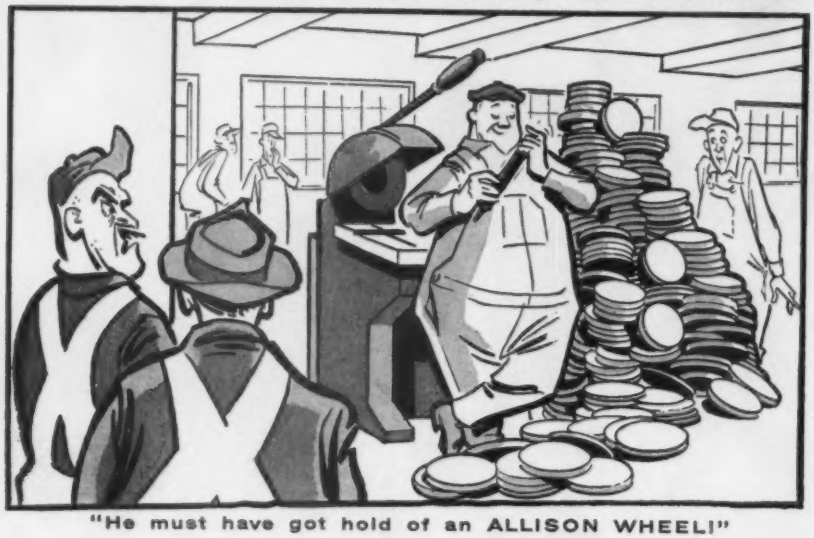
largest selection of Swiss high-precision machine tools in America

cut your costs . . .
where you cut your materials



"He must have got hold of an ALLISON WHEEL!"

Many production managers have been happily surprised at the immediate jump in production when they switched to Allison Abrasive Cut-Off Wheels. This is evident not only in the increased number of pieces per hour, but also in the increased cuts per wheel and the higher quality of the work. The pay-off is more pieces per hour at a *lower cost per piece.*

There is an Allison Wheel to fit almost every job; cut almost every material. If you have a wet or dry abrasive cutting problem, ask Allison first.

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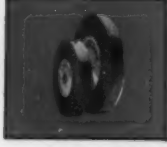

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Allison supplies the finest grinding wheels for portable grinder work.

the *best* way to cut many materials . . .
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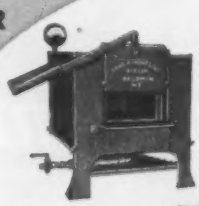

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BURNERS - FURNACES (Heat Treating, Melting, Soldering)

Just Imagine This . . .

You prepare an operation sheet to manufacture a complicated part. Instead of giving that sheet to a group of operators to make the part, you place the sheet into a controller, or a director, and push a button. The controller sets a machine tool in motion, and interprets the operation sheet's instructions to machine the part completely *without human help.*

Impossible? Farfetched? Not quite! It's already been done, and successfully, with Numerical Control. And the maintenance problem is negligible. At M.I.T., for example, a prototype milling machine "director" operated for 8,000 hours with only 3% down-time.

Twenty-four pages of step-by-step facts and pictures on how Numerical Control has been proved practical by extensive study and use are available to you in our special report, "Numerical Control — What It Means to Metalworking." The report tells you what Numerical Control is . . . why it will be used more . . . how numbers control . . . what computers contribute . . . and the 13 plus advantages of using this system. You'll especially want to read the pages that explain why firms *both large and small* will be able to afford Numerical Control.

To get the inside story of today's machine-tool control for tomorrow, write for your copy of this report now. 35¢ each.

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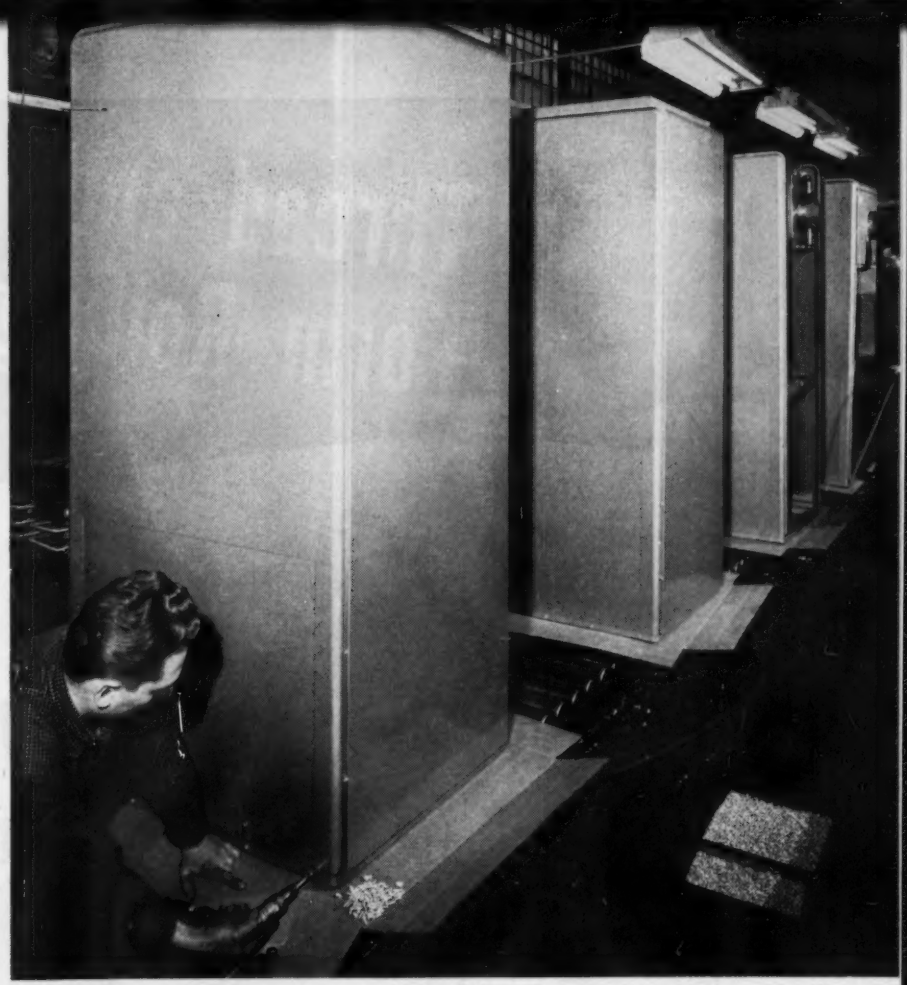
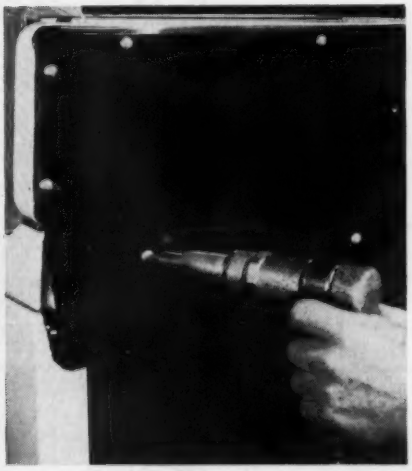
RESULTS SHOW IMPROVED PRODUCTION

...with Phillips
Cross-Recessed-Head Screws



ASSEMBLY LINE MIRACLES result from using Phillips cross-recessed-head screws in *all* Bryant Heater plants on heating, air conditioning and water heating units. Bryant's general assembly director says, "In all exterior or interior applications it is important that we use screws that incorporate easy assembly with rigid fastening — that means Phillips."

QUICK, EASY INSTALLATION applies equally to Fleetlite — "America's FINEST Windows" — and to the Phillips cross-recessed-head screws which assure sturdy, rigid, long-lasting *precision* construction. Says plant manager of Fleet of America, Inc., maker of these windows, "Phillips screws complement the high standards of our extruded aluminum construction. We use them exclusively."



"NEATER APPEARING RANGE through the design of the Phillips screw head," says Assistant Superintendent of Tappan Stove Co., Mansfield, Ohio, founded 1881. "In addition, these screws improve production, speed assembly — and offer several safety factors. They have gained the approval of the men who use them."

• MANUFACTURERS OF • PHILLIPS CROSS-RECESSED-HEAD SCREWS •

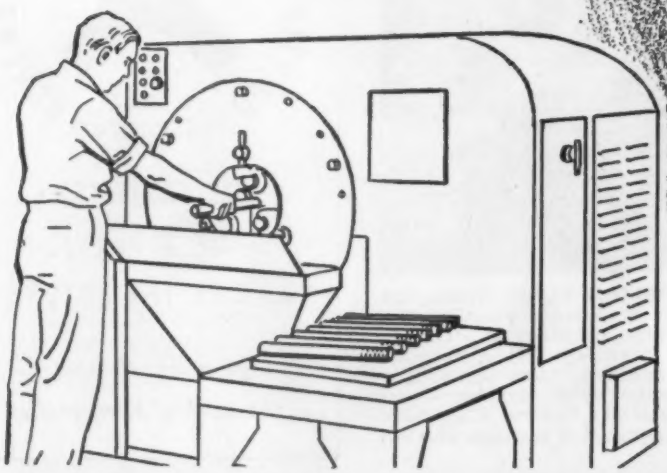
THE FASTENERS
OF TODAY...
AND OF THE FUTURE

✕ *marks the spot*
... the mark of extra quality

Allmetal Screw Products Company, Inc. • American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Company • The Eagle Lock Company • Elco Tool and Screw Corporation • Great Lakes Screw Corporation • The H. M. Harper Co. • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Co. • Parker-Kalon Div. General American Transportation Corporation • Pheoll Manufacturing Co. • Rockford Screw Products Co. • Scovill Manufacturing Co. • Shakeproof Div. Illinois Tool Works • The Southington Hdwe. Mfg. Company Sterling Bolt Company • Universal Screw Company • Wales-Beech Corp.

REED RID CO

Thread and Form Rolling Service



Stays with Your Problem from start to finish

IF IT'S THREAD ROLLING .

Here is help that counts when you need it most

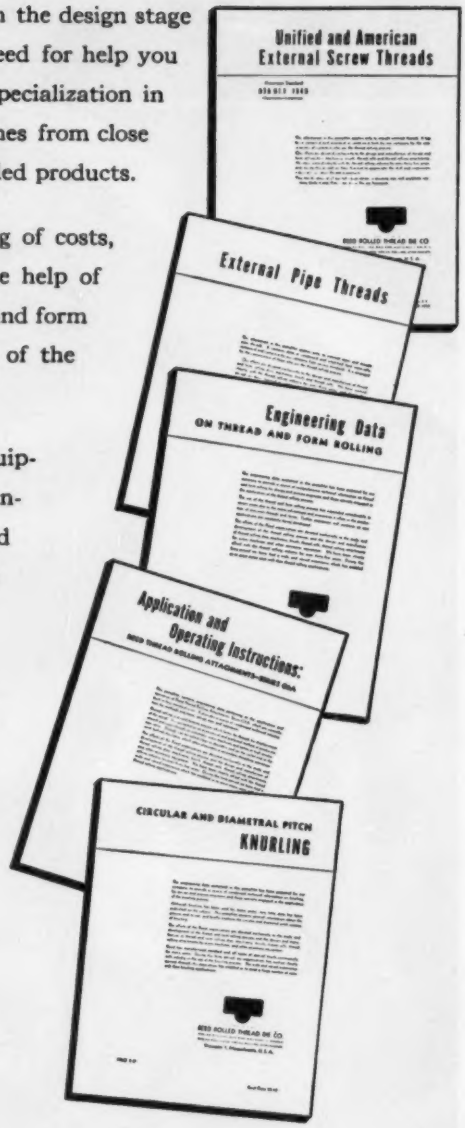
Reed's thread and form rolling engineers work with you from the design stage through to the final production run. When you depend on Reed for help you will have the advantage of more than thirty-five years of specialization in thread and form rolling development. Reed's experience comes from close teamwork with designers and producers of formed and threaded products.

Problems we have solved repeatedly include the lowering of costs, increasing production rates and improving quality. With the help of the Reed experimental rolling department many new thread and form rolling applications have been developed to the advantage of the producer.

Through Reed's program of continuing basic research, equipment and tools are continually being improved and the advantages of the thread rolling process extended. In addition, Reed has facilities for the design and manufacture of special tools and completely automatic equipment.

If you want help, look up your nearest Reed representative, located in principal cities. He is well qualified to assist you with your external threading applications. Skilled service personnel will help you with the installation of Reed tools and equipment and show you how to use them to your best advantage.

Let Reed start with your problem . . . stay with your problem until it is no longer a problem.



REED
ROLLED THREAD DIE CO.
WORCESTER, MASSACHUSETTS

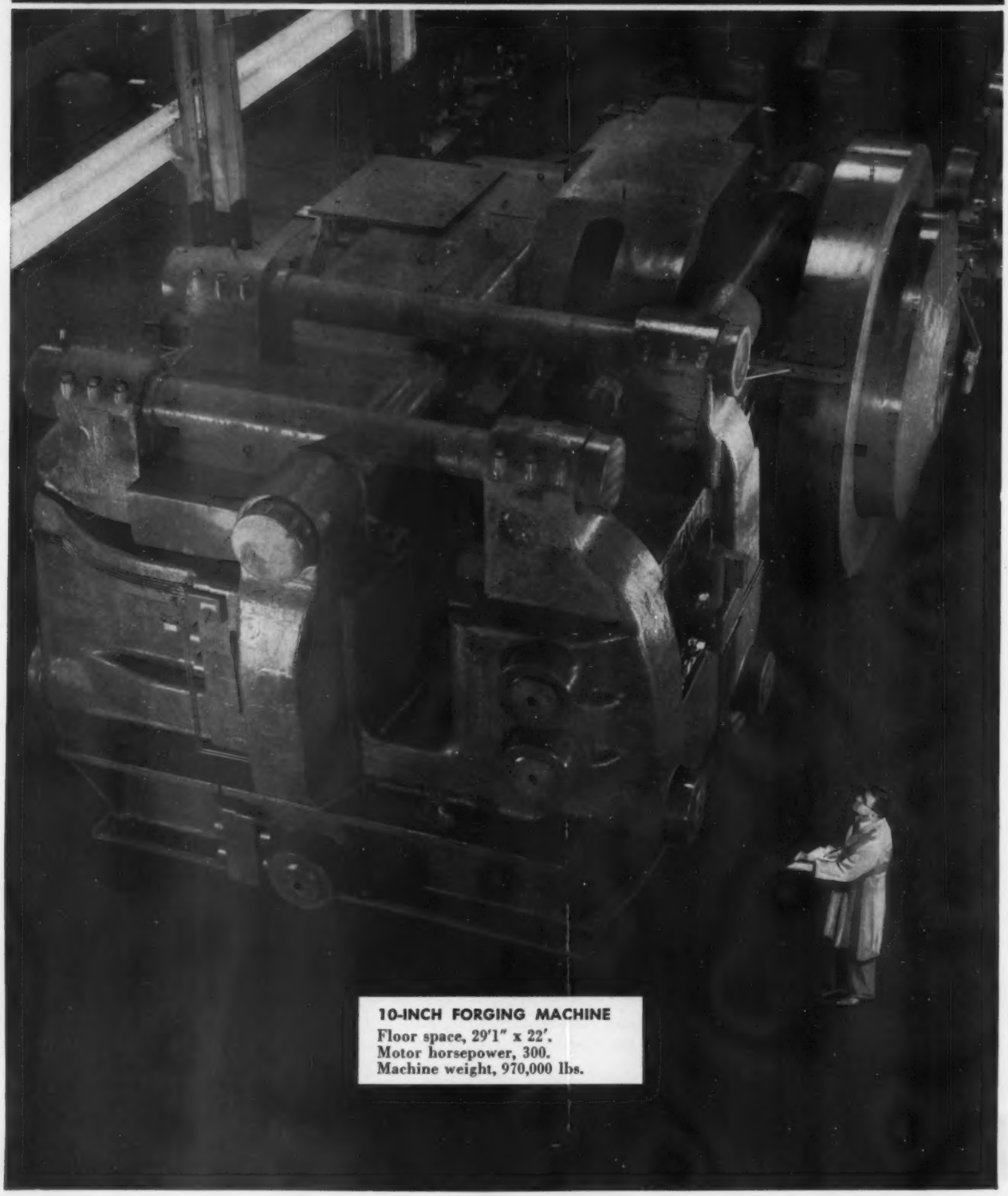
Reed's engineering library, including our own comprehensive technical publications, covers all phases of thread and form rolling, thread specifications and standards. Our technical publications are available to you on request.

THREAD ROLLING MACHINES AND DIES, THREAD ROLLING ATTACHMENTS, THREAD ROLLS AND KNURLS FOR AUTOMATIC SCREW MACHINES AND TURRET LATHES

Sales Offices In: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, Syracuse, Toronto

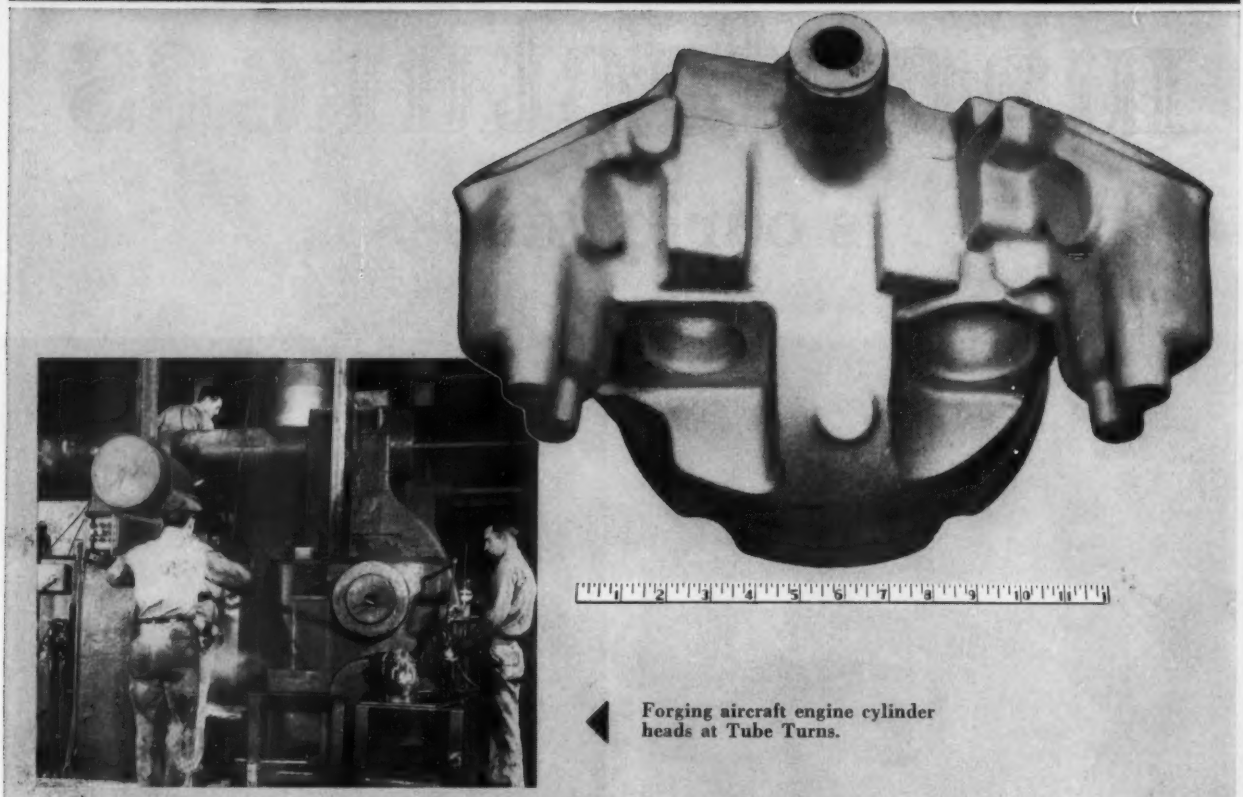
. . COME TO SPECIALISTS

TUBE TURNS INSTALLS the World's Largest



10-INCH FORGING MACHINE
Floor space, 29'1" x 22'.
Motor horsepower, 300.
Machine weight, 970,000 lbs.

A 10-INCH NATIONAL . . . Horizontal Forging Machine!



Forging aircraft engine cylinder heads at Tube Turns.

Tube Turns of Louisville, Ky., relies upon a 10-inch National — the largest horizontal forging machine in the world — to produce efficiently the 72-pound aluminum aircraft engine cylinder head forging illustrated above.

The progressive Tube Turns organization — a division of National Cylinder Gas Company — has long been recognized for its leadership in producing important commercial and aircraft forgings. The installation of the 10-inch Forging Machine is another step in the company's progress.

This is another example of teamwork between forward-looking industry and National Machinery to develop advanced forging methods. To help you "flow metal," our years of experience are available to apply to your forging job, be it routine or unusual, hot or cold, ferrous or non-ferrous, automatic or semi-automatic.

We would be pleased to welcome you at our plant — "World Headquarters for Forging Engineering" — where tomorrow's new and better ways of producing metal parts are already being tested today!

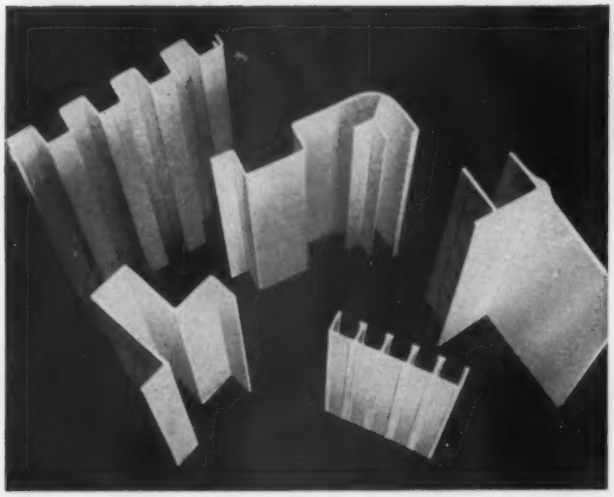
NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Service to manufacturers

is our business



EXTRUDED SHAPES All standard alloys are available in custom shapes (solid, semi-hollow and hollow), structural, rod and bar, and in extruded tube.

SHEET AND PLATE Supplied as flat sheet, plate, coil sheet, circles in a complete range of alloys, sizes and tempers. Specialty sheets available on inquiry.

As a basic producer of aluminum, we are in the business of supplying manufacturers of end products.

Therefore, our efforts are put behind the job of serving these manufacturers—and helping them in the solution of *their* problems.

In recent years, our services have been expanded in order to keep pace with our greatly increased production capacity—which today is close to 30% of all the primary aluminum made in this country.

To give you fast personal service, we have expanded our sales offices to key cities throughout the country.

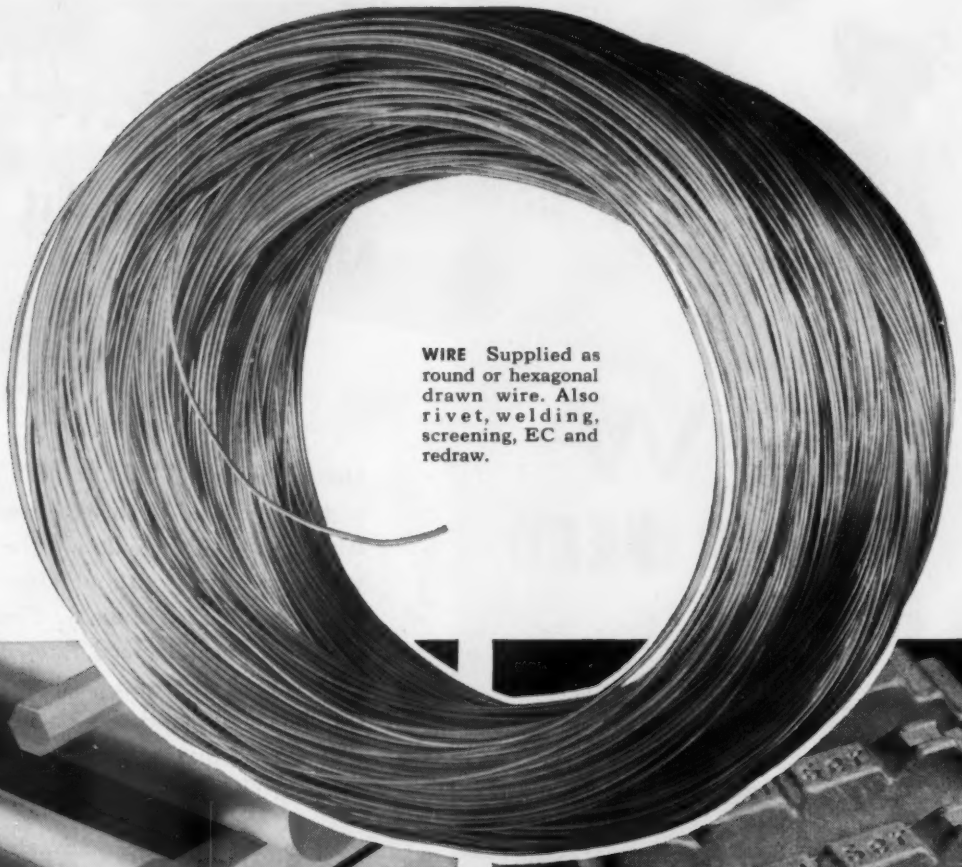
We have expanded our distributor program so that we now have a warehouse distributor in almost every major city.

We have increased our sales force and our staff of field engineers, employing specialists in many fields, such as roll-forming, extrusions, conductor, etc.

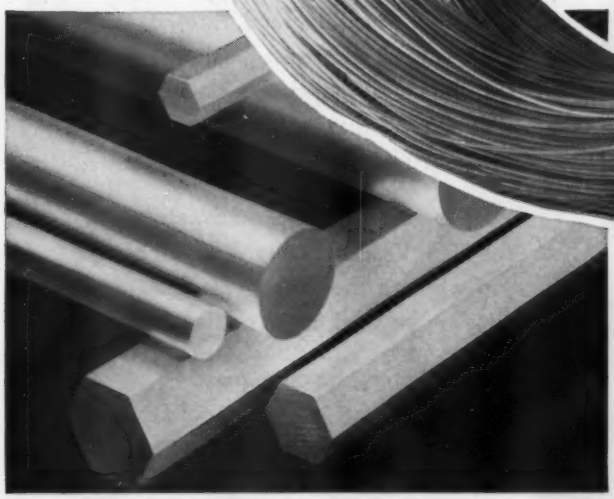
However, important as these additions are, we believe the most significant thing about Kaiser Aluminum's service is the attitude behind it. An attitude that moves men to work harder, longer, and with greater determination.

We believe that the kind of service we offer—combined with the unsurpassed quality of Kaiser Aluminum—should be of particular interest to all aluminum fabricators.

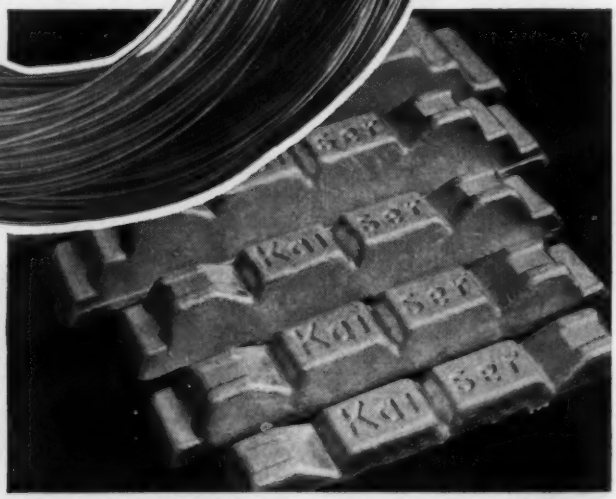
Setting the pace... in growth, quality and service **Kaiser**



WIRE Supplied as round or hexagonal drawn wire. Also rivet, welding, screening, EC and redraw.



ROD AND BAR Available in a wide range of alloys in rolled and cold finished rod and bar, round and hexagonal standard screw machine stock, hexagonal bar, redraw rod, rivet rod and round forging stock, square and rectangular bar.

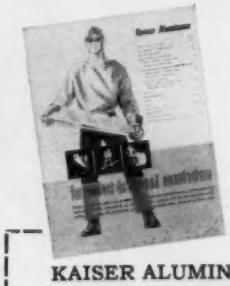


PIG, INGOT AND BILLETS Kaiser Aluminum produces Pig, Ingot and Extrusion Billets in a range of alloys and sizes to meet your specific requirements.

For complete information, call or write any Kaiser Aluminum sales office or one of our many distributors, located in principal cities. See our catalog in Sweet's Product Design File or write for copy. Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Palmolive Bldg., Chicago 11, Illinois. Executive Office, Kaiser Bldg., Oakland 12, California.

Other Kaiser Aluminum products include: industrial foil, and electrical conductor. Kaiser Aluminum also supplies household, freezer and broiler foil for home uses; Shade Screening for the building industry and roofing and siding sheet for farm and industrial buildings.

Aluminum



Send for the new
PRODUCT DESIGN CATALOG,

containing 24 pages of valuable information on all Kaiser Aluminum Products.

KAISER ALUMINUM & CHEMICAL SALES, INC.
Industrial Service Division
5544 Kaiser Bldg., Oakland 12, California

Please send my free copy of the Product Design Catalog.

Name_____

Firm_____

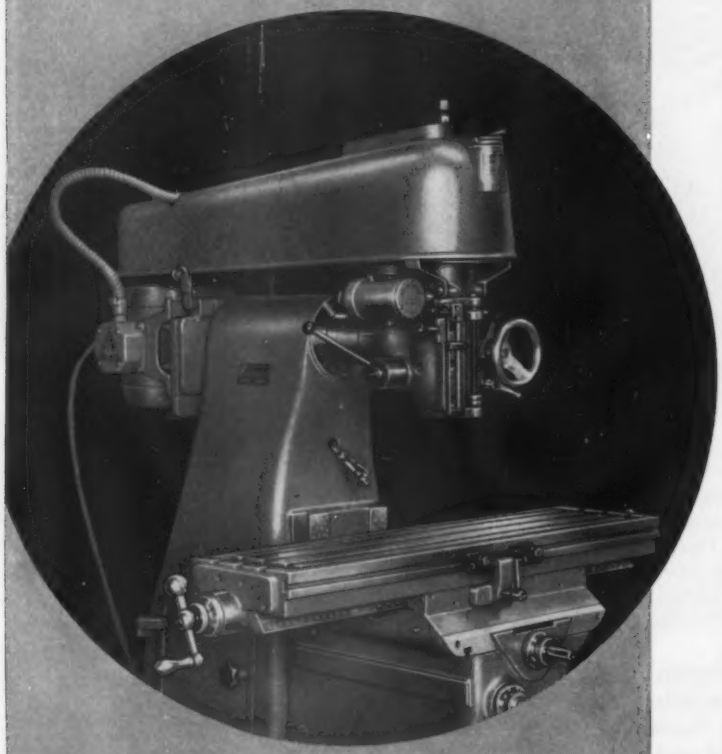
Address_____

City_____ State_____

does MORE work... MORE easily

new POWER FEED HEAD

U. S. Vertical Miller



Write for descriptive folder

Here's the new U. S. Vertical Miller with Power Feed Head – the head into which U. S. has built all the most wanted features without sacrificing traditional U. S. simplicity. Check its infinitely variable feed rate, its 800 pounds of down thrust on the quill, its supplemental hand feeds – it is the milling head that was designed to meet all shop needs.

Add to these the basic advantages of the U. S. Vertical Miller. You can easily see why it's the milling machine that "does more work more easily."

Detailed literature on request.
The U. S. Burke Machine Tool Division.
6 Brotherton Road, Cincinnati 27, Ohio.

more versatile
Feed infinitely variable from .002" to .008" while in operation

greater capacity
5½" power quill travel; 800 lb. down thrust

more convenient
Supplemental hand feeds

increased rigidity
Enclosed hard chrome plated quill with internal lock

THE U·S·Burke MACHINE TOOL DIVISION

THE MACHINE TOOL SHOW

SEPTEMBER 6-17, 1955
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.

24,412* production executives in search of lower costs!

They'll find them (and you'll find them, too) at the Machine Tool Show. More than ninety per cent of the country's leading machine tool builders will be there, ready to demonstrate to you their newest models, their fastest, most ingenious cost-cutting metalworking methods.

The machine tool accessory manufacturers will be in Chicago, too—and you're invited to attend their Production Engineering Show, on the Navy Pier. Your Machine Tool Show badge is good at both shows.

Plan now to be on hand. The 1955 Machine Tool Show is the best chance you've ever had to see **the world's best investment**—***in action!***

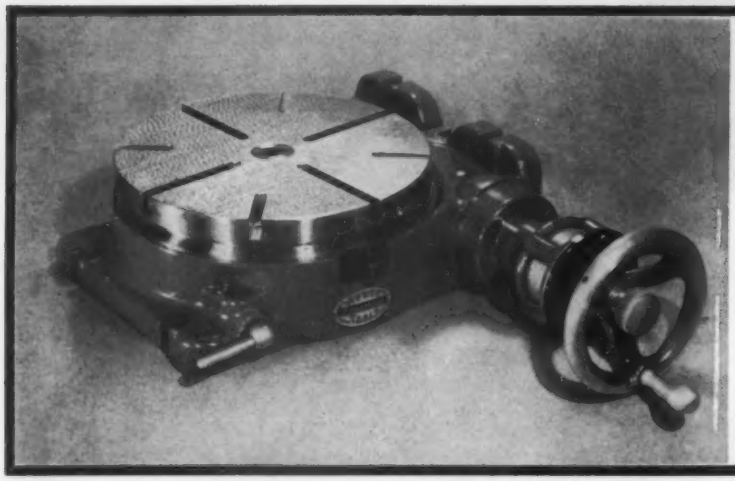
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
2071 East 102 Street • Cleveland 6, Ohio

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

M E T

* Estimated Attendance, Before Receiving Your Reservation

For angular spacing jobs so precise you could never handle them before



A Rotary Table accurate to ± 3 sec. in 360°
(USING CHART)

No. 2 Moore 11-Inch Rotary Table, *developed by the builder of the Jig Borer and Jig Grinder.*

THE FOLLOWING ACCURACY BUILT FOR SHOP USE:

All points in 90° increments, from zero, ± 1½ sec.
All points in 18° increments, from zero, ± 2 sec.
All points in 2° increments, from zero, ± 4 sec.
Worm accuracy, ± 1 sec.
Repetition of settings, ± 1 sec.
4 sec. = .0001" on 10" dia.

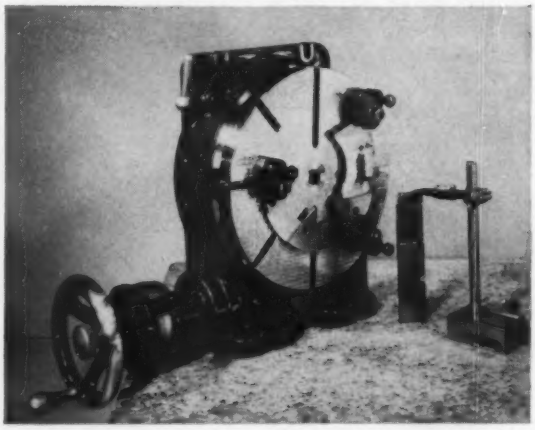
How many jobs have slipped by you because the angular spacing requirements were just too much for your equipment?

With Moore's new 11-Inch Rotary Table, you can easily handle the most precise angular measurements. Having an overall performance accuracy of ± 6 seconds throughout the entire 360°, this table is already being used successfully by several leading companies on government-sponsored precision jobs never before accomplished.

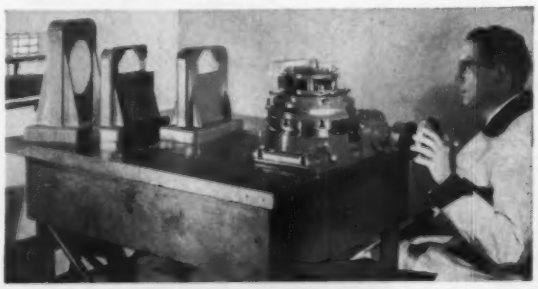
This extreme accuracy is achieved by a non-disengagable, thread-ground worm, combined with accurately spaced teeth of its mating gear. An ultra-sensitive method of angular measurement—interferometric inspection and calibration—used industrially for the first time, assures tooth spacing accuracy within less than ± 4 seconds.

You can use this rotary table for countless precision spacing applications on jig borers and jig grinders. Examples: Spacing holes in a circle on either machine; set at right angle for additional machining and inspection jobs; with its companion unit, the new No. 2 Sine Plate, to produce compound angle settings. Write today for Bulletin RT2.

MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Connecticut



Accurate in vertical as well as horizontal position. Additional vernier permits normal reading even in vertical position.

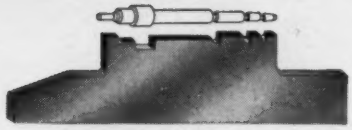


Accuracy assured by interferometric inspection and calibration. This is the first time industry has used light-wave measuring methods for precise division of the circle.

ADD MOORE SPEED + ACCURACY TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

91 days Continuous Production . . . with Talide®-TIPPED CENTERLESS BLADES



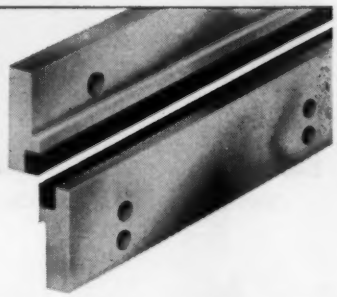
LARGE ELECTRIC MOTOR PLANT

PART.....Stainless Steel Rotor Shaft for Electric Motor.
OPERATION.....Grind 7 diameters simultaneously.
MACHINE.....No. 2 Cincinnati Centerless Grinder.
BLADE.....Special multiple step Talide-tipped work support blade No. C-4884.
RESULTS.....Talide-tipped blade in continuous production for 91 days (2 turns per day) compared to best previous production run of 3 days with hard alloy steel blade.

Talide-tipped centerless grinder blades are stocked in over 50 styles and sizes for all types of infeed and thru-feed operations. Special blades for form work including tapered pins and arbors, shafts having multiple diameters, and parts with special contours can be supplied to order. Send print or sketch for quotation.

800,000 CUTS WITH TALIDE SHEAR BLADE!

A leading electrical manufacturer shearing .014" silicon steel for transformers has completely equipped their press line with Talide-tipped blades in lengths ranging from 17" to 64". Blade life is averaging 800,000 cuts per grind compared to 10,000 cuts obtained with steel blades, and customer estimates annual savings of $18,000.



One-piece Talide strip (up to 100" without seams) prevents scoring and scratching. Write for new 84-page Catalog 55-G or ask for sales engineer to call. Metal Carbides Corporation, Youngstown 7, O.

LARGE SAFETY RAZOR COMPANY NETS $20,000 SAVING!

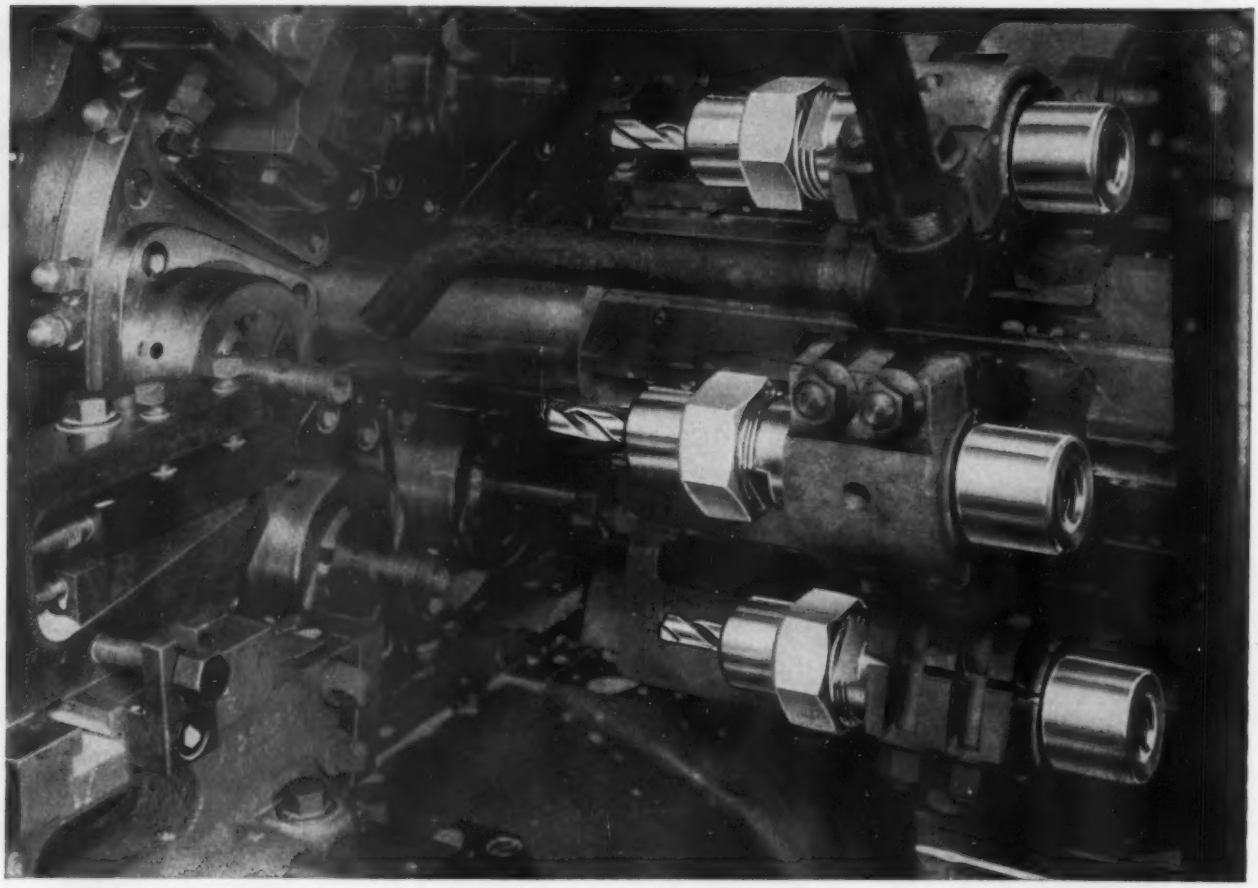
After unsuccessfully experimenting with several other brands of carbide knives, the world's largest razor blade company tested and accepted Talide rotary knives as being far superior to any knife for the gang slitting of razor blade strip steel.

Phenomenal runs of 90 to 1 over hi-carbon, hi-chrome knives and the smoother, burr-free cuts obtained have reduced customer's slitting expense by more than $20,000. Over 1200 coils were gang slitted with Talide knives compared to an average of 15 coils with steel knives. More tonnage was produced in 1 regrind of the Talide knives than over the entire life of a set of steel knives.

Outstanding production runs like this are possible because of the extra dense and porous-free structure of Talide metal. Try Talide blades and knives on your next shearing or slitting job. They're hard to beat and harder to wear out!

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



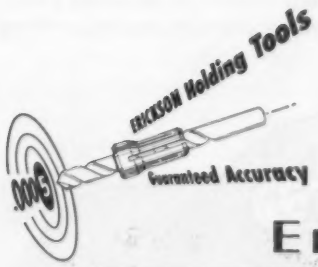
Courtesy The National Acme Co.

better holding tools give a tighter grip on production costs

Wide experience with Erickson chucks explodes the *idea* that ordinary holding tools "will do" . . . emphasizes the *fact* that your production costs plummet with Erickson's superior holding power and accuracy.

That's why The National Acme Co. usually furnishes Erickson collet chucks. Because with Erickson you reduce set-up time . . . get faster feeds and speeds by "stubbing" tools. Guaranteed accuracy of .0005" and greater gripping power assure proper drill alignment . . . drills cut evenly on both lips . . . give more holes per grind.

So come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.



Send for Catalog K today; you'll find many interesting applications for all Erickson holding tools.

ERICKSON TOOL COMPANY

2309-5 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES AA-1358

new! ADVANCED ENGINEERING FEATURES

new! EXTRA-HIGH FLOW RATES

new! QUICK-OPENING LIDS

announcing

A COMPLETE NEW LINE

of HONAN-CRANE

OIL FILTERS

. . . the first in a series of important engineering developments by the **NEW** Corporation . . .
HOUDAILLE-HERSHEY OF INDIANA, INC.

"F" type Full Flow

Designed for in-line installation at extremely high flow rates—25 to 800 GPM. Features low pressure drop—only 4 PSI across unit at 170 SUS. Uses new "FLO-PAC" pleated paper cartridge, removes particles down to one micron.

"B" type Bulk Refill

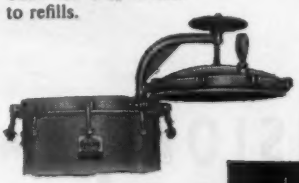
For applications where oil must be kept absolutely clean . . . bulk Cranite medium provides depth purification. Bulk or cartridge type cellulose refills are available for fine filtering . . . permitting "custom" filtration.

"M" type Multi-Cartridge

Available in eleven sizes with six different types of cartridge filter elements to give exact degree of filtration needed. New "FLO-PAC" and "KLEER-PAC" cartridges feature exceptionally high efficiency—large dirt holding capacity.

All models have new Quick-Opening Lids

Purifier lid is fastened with swing bolts which one man can loosen quickly. Lid swings back for easy access to refills.



WRITE FOR ENGINEERING BULLETINS AND QUOTATIONS ON ALL THREE MODELS.

HH of Indiana

HOUDAILLE-HERSHEY OF INDIANA, INC.
FILTRATION DIVISION

205 WABASH AVENUE, LEBANON, INDIANA

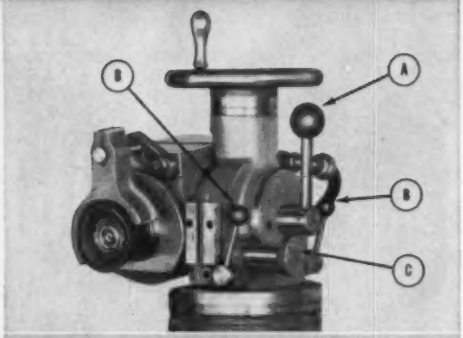
Now COVEL NO. 12A

UNIVERSAL CUTTER AND TOOL GRINDER

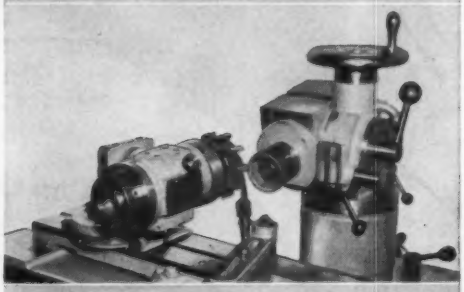
Equipped with

POPE *TILTING HEAD*

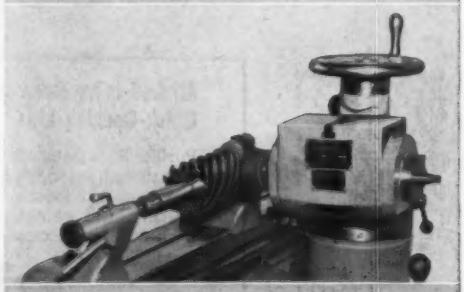
with motorized 1 h.p. spindle



A—Positive, quick-set *tilting* lock.
B—Positive, quick-acting *swivelling* lock.
C—Fine adjustment for tilt.



Setup for grinding a face mill. Lip rest located on table of grinder.



Setup for grinding a slab mill. Lip rest located on head.

You save time and money with a Covel No. 12A Grinder equipped with this versatile Pope Tilting Head which has proven its dependability in thousands of installations. You can . . .

- √ Use cup wheels for practically all clearance angles, producing a stronger, longer-lasting cutting edge on tools.
- √ Keep the tooth rest on the center line of the cutter for practically all grinding on centers or in the work head.
- √ Grind most cutters and reamers all over with a single setup.
- √ Read all clearance angles directly in degrees from the scale provided on the head.
- √ Get the right clearance angles on such tough grinding jobs as slab mills, taper reamers, angular cutters and form tools.
- √ Have a head that is so easy to adjust and use it saves you time and money every time you grind a tool. Degrees of clearance are easy to establish. Tilt adjustment has small pinion which engages a gear segment on tilting head, a Covel feature. Swivel and tilt clamps are quick-acting.

For complete information on the Covel No. 12, write for Bulletin No. AM-115.

COVEL PRECISION GRINDERS

BENTON HARBOR
MICHIGAN

HYDRAULIC & HAND FEED SURFACE GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

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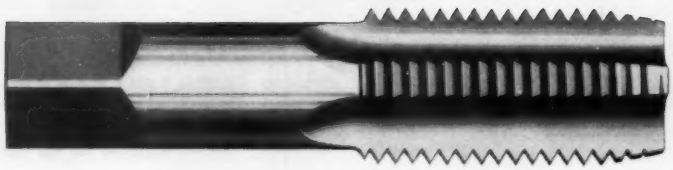

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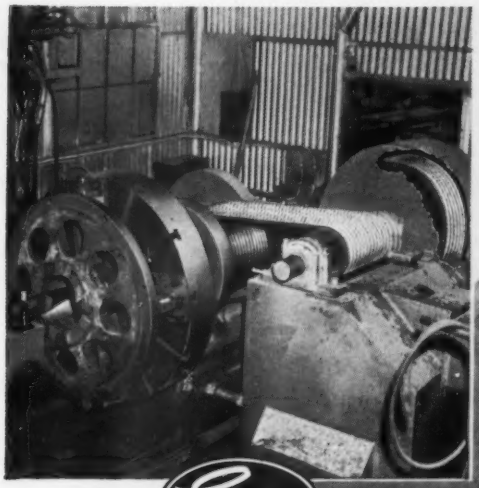

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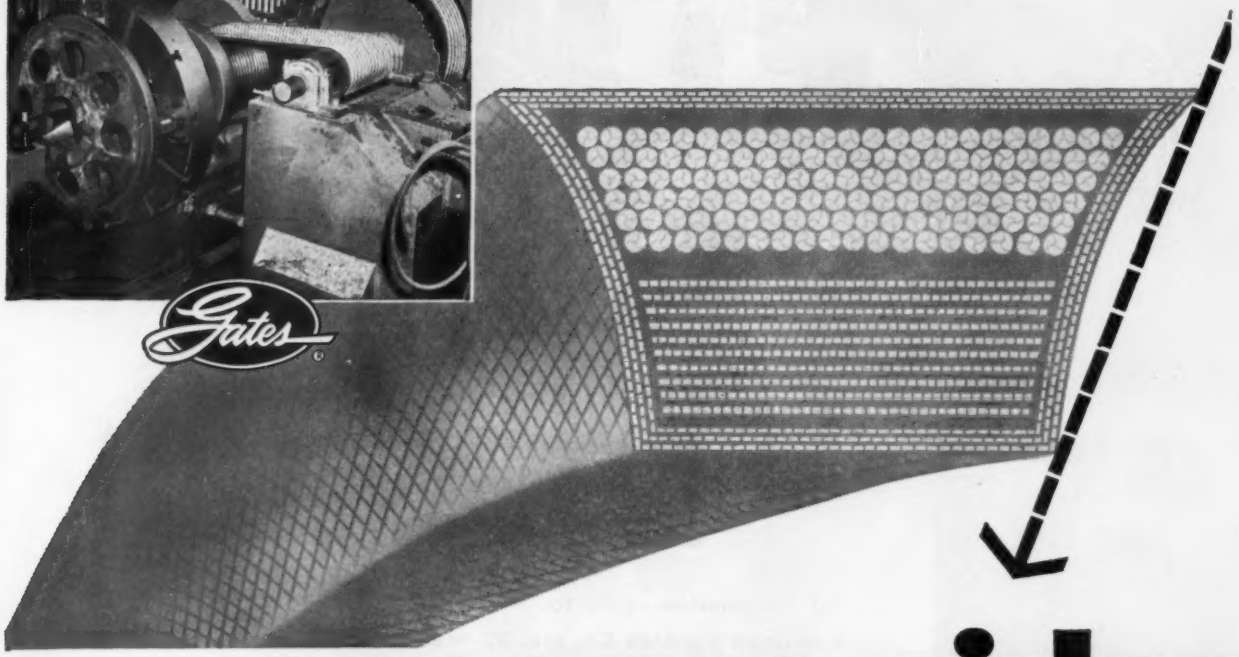

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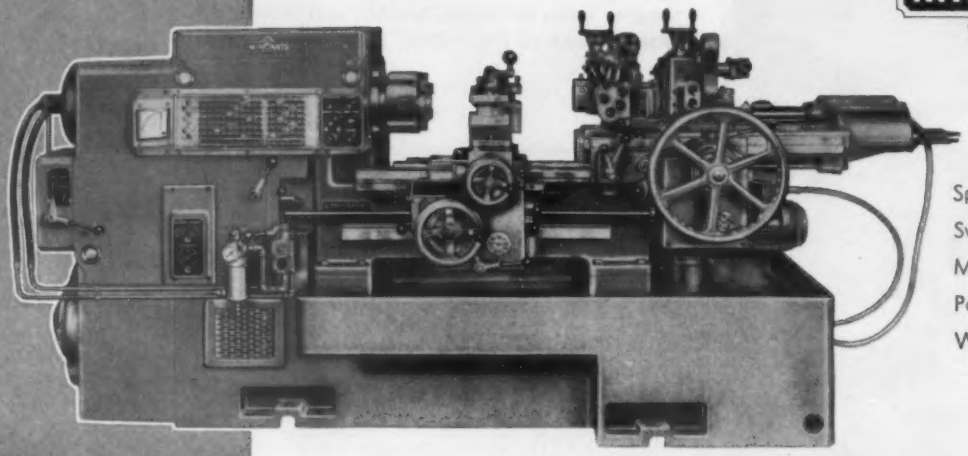

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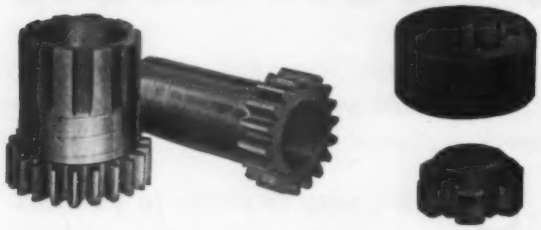

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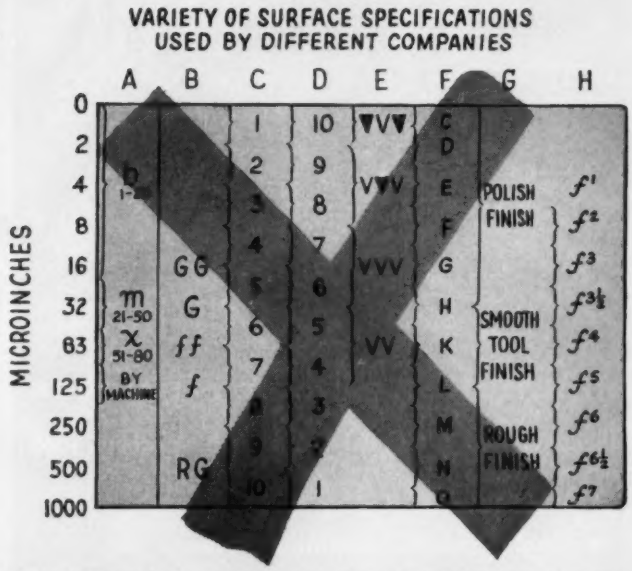

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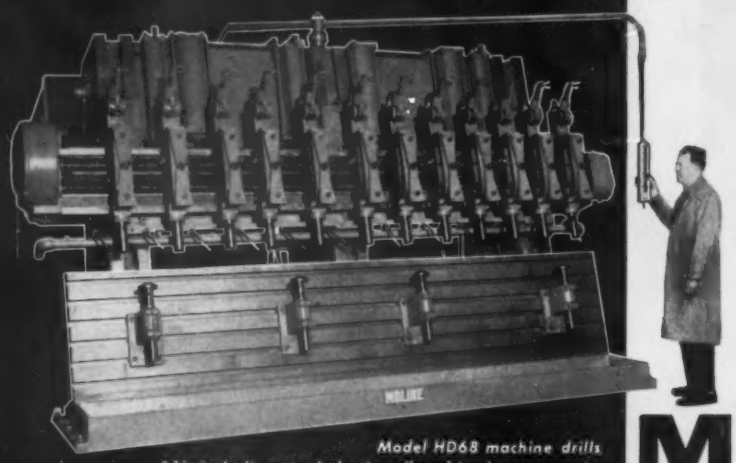

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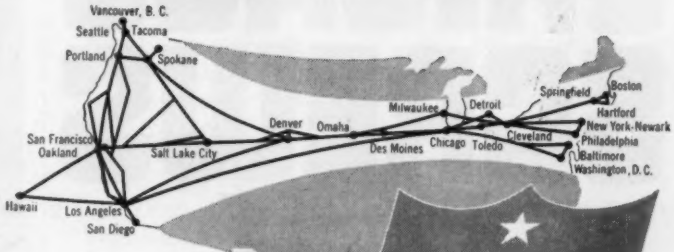

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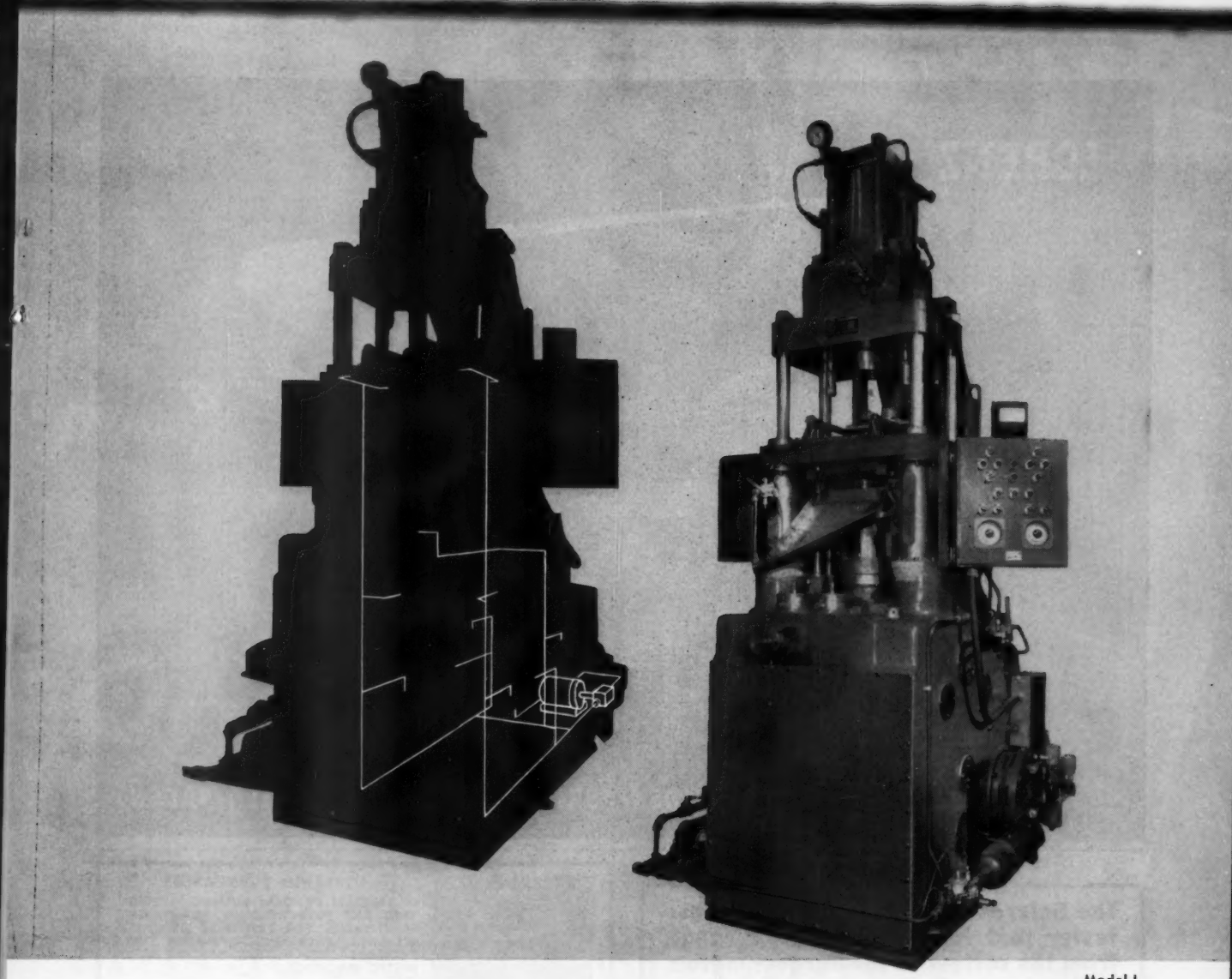

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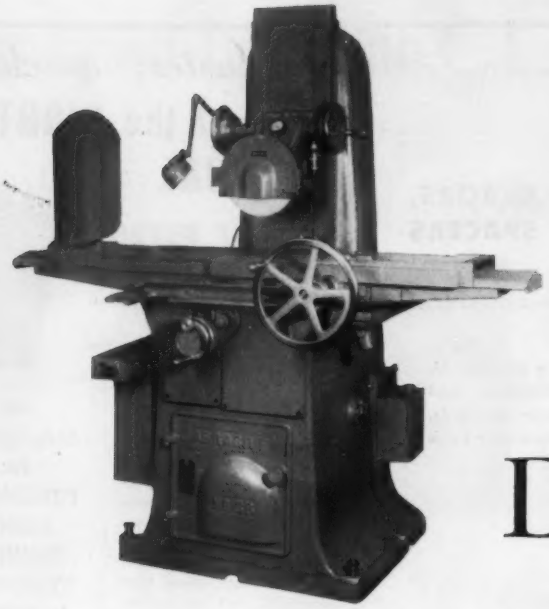

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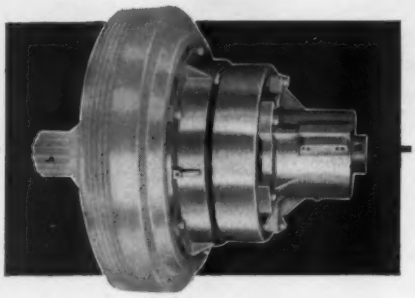

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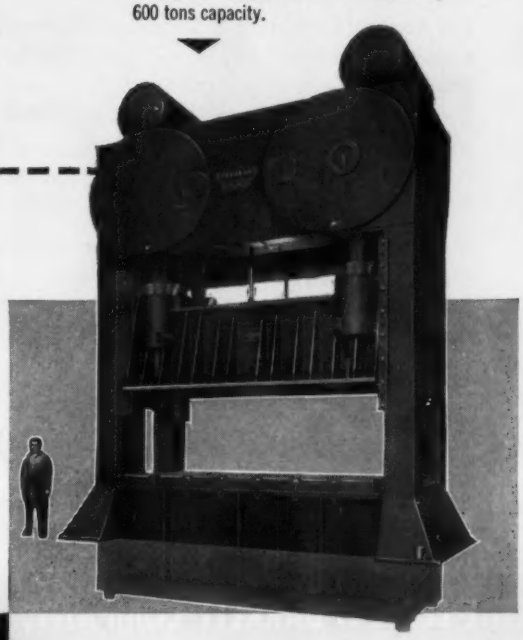
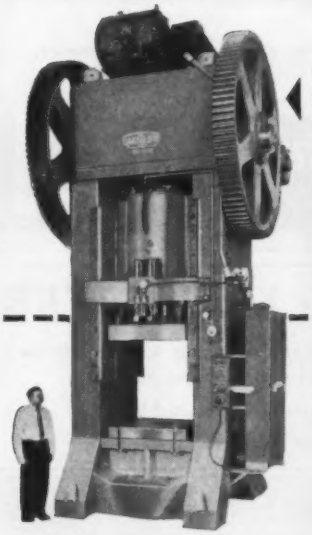
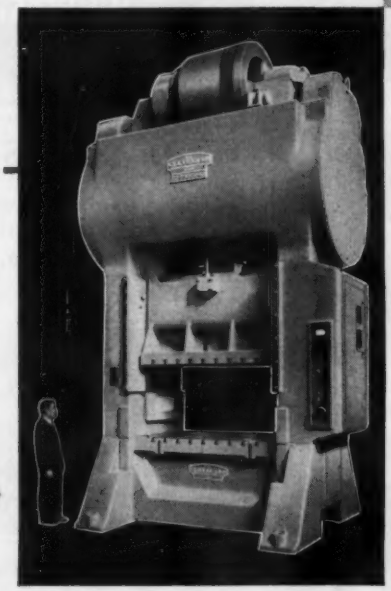




Cleveland S 1-800 Single Crank Press double geared, 16" stroke, 48 x 42" bed area, 800 tons capacity.



Cleveland S 2-350-60-42 Double Crank Press, 8" stroke, 42 x 60" bed area, 350 tons capacity.

It doesn't matter which of the 11 types of Cleveland presses best meets your requirements. For as long as it is equipped with our patented Cleveland Clutch, you can be confident that you are getting a press that will give you the best performance obtainable. This proven clutch unit assures minimum down-time, positive, fast control and lower operating costs.

Designed with a minimum number of parts, the patented Cleveland Drum Type Friction Clutch requires only minor adjustments. There is less chance of failure. Its light-weight construction reduces horsepower required for operation. Operational studies prove it to be completely dependable.

Why not investigate the production economy built into every Cleveland Press Equipped with our patented Cleveland Drum Type Clutch. Won't you let us give you the complete Cleveland story? Write or call today!

1880 75 1955
YEARS OF CONSTANT PROGRESS
Diamond Anniversary

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

POWER PRESSES
FABRICATING TOOLS

E. 40TH & ST. CLAIR AVENUE • CLEVELAND 14, OHIO

Offices at: NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING • OXFORD, O.

CITY FOUNDRY DIVISION • SMALL TOOL DEPARTMENT

BARRETT "FILWHIRL" ENAMELERS make easy work of many difficult coating problems

The Barrett "Filwhirl" is a Centrifugal Enameler providing a clean, sure and economical way of applying finishing materials to parts or products that can be rotated in fair balance in the revolving bowl. It wastes no coating material, and reduces time and expense when compared with other methods of applying a good commercial finish. It is designed for bulk handling, and can be depended upon for speedy production requirements.

It has proven highly successful in the coating of helical springs, clips, clasps, zipper parts, bead and link chain, toys, automobile and luggage hardware, misc. metal stampings, castings, etc. Excellent results are also obtained with japan, lacquers, varnishes, paints, waxes. No drips or fatty edges.

Furnished in spindle post, fixed bowl, and carrier types in several capacities. Safety features included and auxiliary equipment is available.

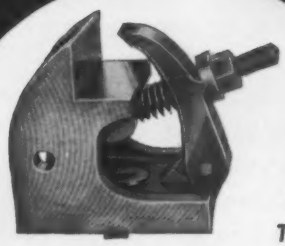
Send a few representative samples to be processed and submitted for your examination.

The Barrett Centrifugal Enameler.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

CUT SET-UP COSTS HUNDREDS OF WAYS WITH HART MILLING FIXTURES



"Masters of A Thousand Set-ups"

Eliminate the need for many special expensive jigs and fixtures.

You will save time and money on most set-ups with Hart Milling Fixtures. They hold round, hexagonal, octagonal or square stock, for miller, shaper, drill press and tapper; they reduce set-up time and speed production. Hart Milling Fixtures are made in four useful sizes, and designed to be used in horizontal or vertical position. Let us send you full description and prices.

Write for illustrated folder

WALTER W. FIELD & SON, INC.

39 Hayward St., Cambridge 42, Mass.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

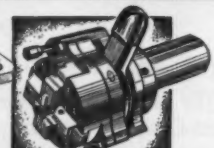
POPE PRECISION SPINDLES for Grinding, Boring, Milling

Belt Driven · Motorized · High Cycle · Special

Let us send you Data Sheets

POPE MACHINERY CORP., 261 River St., Haverhill, Mass.

H&G Insert Chaser DIE HEADS

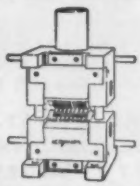


famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 20-40 Barnby St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

EMBOSSING HEADS

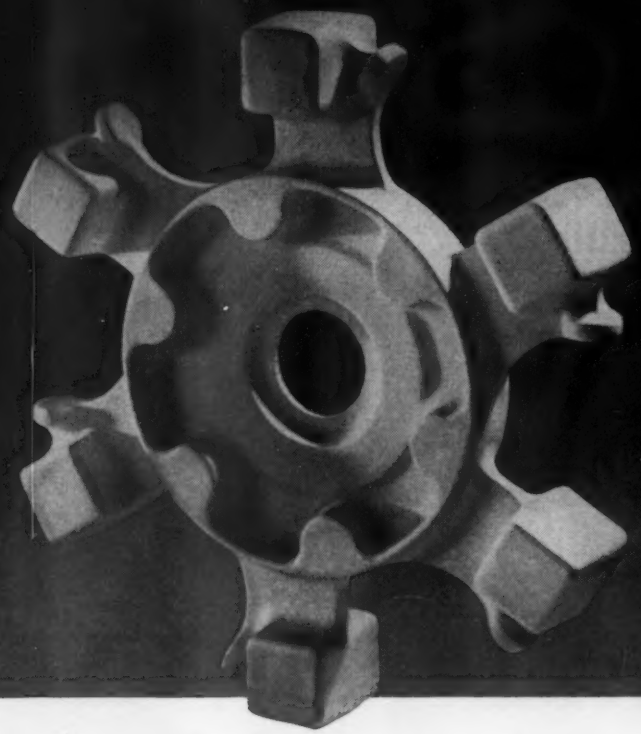
FOR RAISED OR SUNKEN NUMBERING ON SHEET STEEL, BRASS, ALUMINUM AND OTHER METALS.



Made by the makers of America's most complete line of marking equipment.

ACROMARK Company

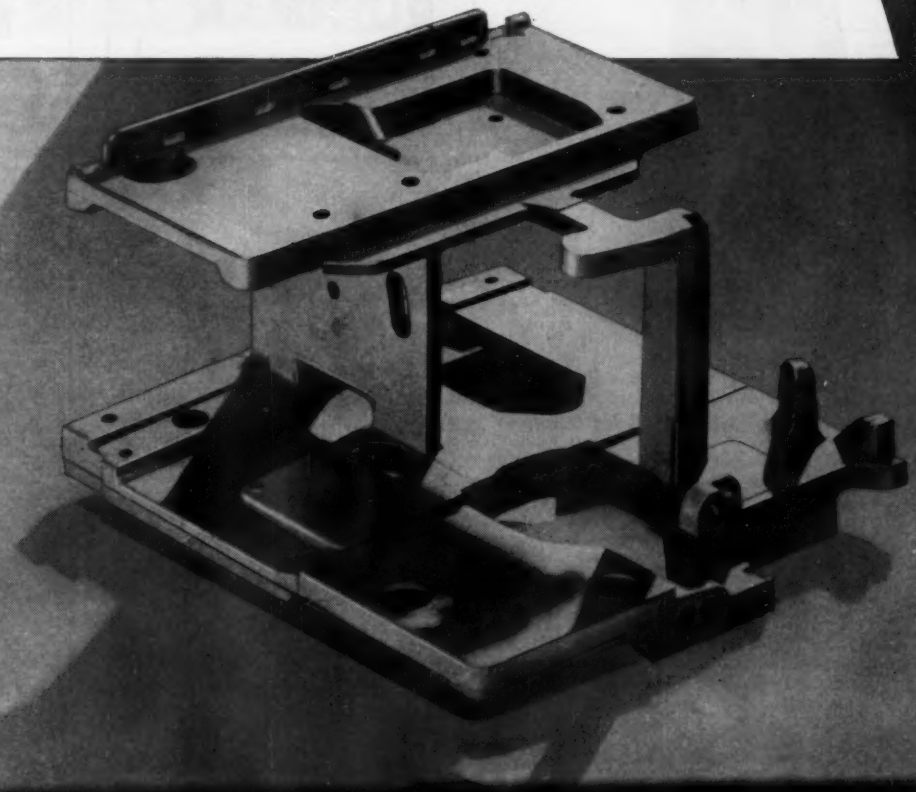
7-13 MORRELL ST., ELIZABETH 4, N. J.



Hiduminium
makes the most of *Aluminium*

Hiduminium Forgings and Die Castings for all industries.

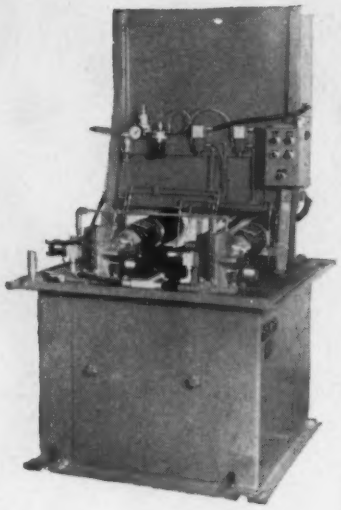
HIGH DUTY ALLOYS LIMITED. AGENTS: RUSSELL ASSOCIATES INC.
165 ORINOCO DRIVE, BRIGHTWATERS, L.I., N.Y.



Automation Speeds Up Hole Drilling

•

New Machine Drills 40 Pieces Per Minute



Drilling at a higher production rate and a lower production cost is the result achieved by applying the principles of automation in the designing of this new Govro-Nelson Automatic Drilling Machine for drilling a .135 hole in a brass part.

The machine incorporates two independent Govro-Nelson Automatic Drilling Units, each being completely interlocked with an air-operated magazine which is kept filled by the operator or mechanically.

The parts are automatically clamped, drilled and ejected into a chute, permitting complete automation. Output rate: 40 pieces per minute.

If you would like to speed up your production rate and reduce production costs on drilling operations, send samples and part prints for our engineering staff's recommendation. No obligation.

WRITE FOR *Literature*

Automatic DRILLING UNIT

GOVRO-NELSON CO.

Machinists of Precision Parts for 32 Years

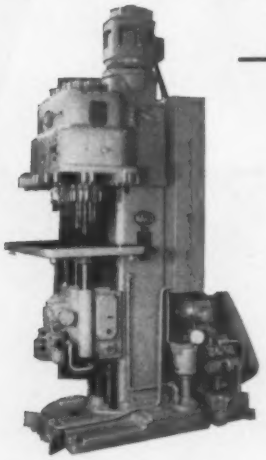
1933 Antoinette

Detroit 8, Mich.

Look to the Future

with

RUTHMAN GUSHER COOLANT PUMPS



Illustrated is a #H6-904 National Automatic Tool equipped with a Gusher Coolant Pump.

Originators of the vertical ball-bearing machine tool motor driven coolant pump, Ruthman has maintained its reputation for excellence during the years by constant attention to quality, performance, and flexibility to customer requirements. In the future, as in the past, you can count on Ruthman to pioneer improvements and refinements that will make the Gusher an even better and more efficient pump for you.

THE **RUTHMAN** MACHINERY CO.

1818 Reading Road — Cincinnati, Ohio

WHAT'S HAPPENED TO WAGES AND PRICES IN METALWORKING?

A comparison of '54 and '53 average wages and prices, plus the percentage of change, is listed for all major manufacturing groups of this industry in your 1955 PRODUCTION PLANBOOK issue of *American Machinist.*

Many other facts and figures in the PRODUCTION PLANBOOK's *economic report* can help you judge the amount of business you can expect this year . . . how much your payroll may rise or dip . . . give you many more clues to your firm's probable profit picture.

Even more valuable to you are the 1955 PRODUCTION PLANBOOK'S more than 2,000 production "nuggets" and the data-crammed special report on *How to Work Steel.*

American Machinist

McGraw-Hill Building

New York 36, N. Y.

DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

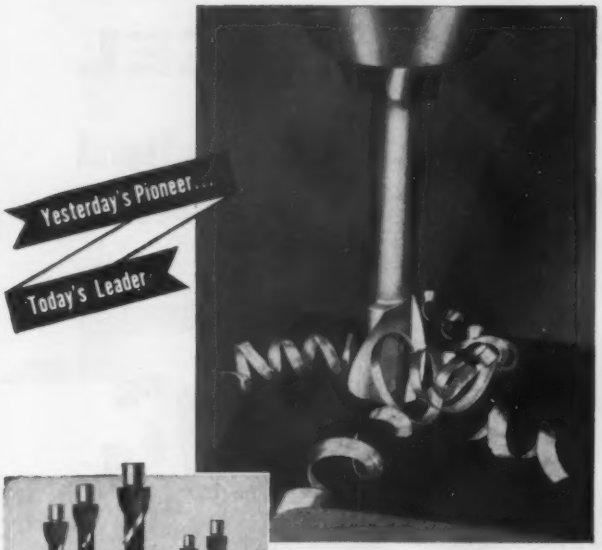
Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

Henry Disston & Sons, Inc., Steel Sales Division
520 Tacony, Philadelphia 35, Pa., U.S.A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING

WELDON
"TU-LIP" COUNTERBORES



for
FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

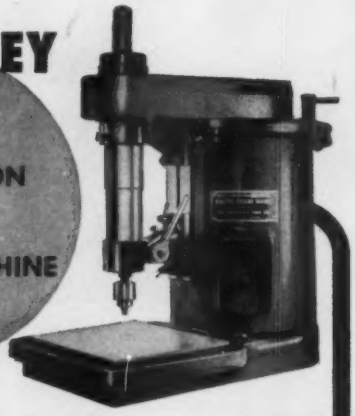
Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

WRITE FOR LATEST CATALOG NO. 10.

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

SIGOURNEY
M-100
the PRECISION BENCH DRILLING MACHINE



No ordinary bench drilling machine, but an extremely accurate, high speed, sensitive machine for precision drilling. Drills from ¼" down to extremely small sizes. Successfully used down as far as .008".

Table and column exactly squared, one to the other, and built with strength and rigidity for maintained accuracy. Hardened and ground spindles insure long life. Sealed ball bearings throughout for smooth operation from 4,000 r.p.m. to 10,000 r.p.m. Motor, driving belt, and spindles entirely enclosed for safety. Available with 1, 2, 3 and 4 spindles.

SEND FOR ILLUSTRATED BULLETIN

THE SIGOURNEY TOOL CO.
HARTFORD 6, CONN.

Sole Sales Agent
PRATT & WHITNEY
Division Niles-Bement-Pond Co. --- West Hartford, Connecticut

SPLINE GAGES

MAYES spline gages are carefully controlled as to design, material, heat treatment, tolerance and finish to assure our customers of the best obtainable gage for the part inspected.

OTHER MAYES PRODUCTS

- MASTER GEAR
- INDEX PLATE
- BROACHES
- FIXTURE GAGES
- BUILT-UP GAGES
- POWDERED METAL DIES
- SERRATION DIES
- GEAR DIES

MAYES TOOL CO.
Designers & Manufacturers
26514 W. 7 MILE ROAD • DETROIT 19, MICHIGAN

A Scharmann Extra WITH PLUS VALUE ~ OPTICAL MEASURING DEVICE

● If you are looking for an economical machine of highest accuracy and utmost production, it will pay you to investigate Scharmann Boring, Milling and Drilling Machines.

The 3-way bed is an outstanding feature. All ways are flat and hand scraped. The center way, constructed as a dovetail, acts as a longitudinal guide for saddle and boring bar stay and prevents lifting of saddle and table. The upright is of extremely heavy, full ribbed box construction assuring full rigidity under severest conditions. This heavy, rigid construction is the back bone of Scharmann accuracy and productivity.

On work requiring ultra precision Scharmann provides an optical measuring device as an extra. This unique device consists of a precision engraved glass scale and Zeiss Microscope plus a dial indicator. This unit gives readings accurate to .0004" for headstock, boring bar stay bearing travel and table cross travel. All settings are optically adjusted without contact with scale itself, hence no wear and tear on instrument. Scale is illuminated over its entire length.

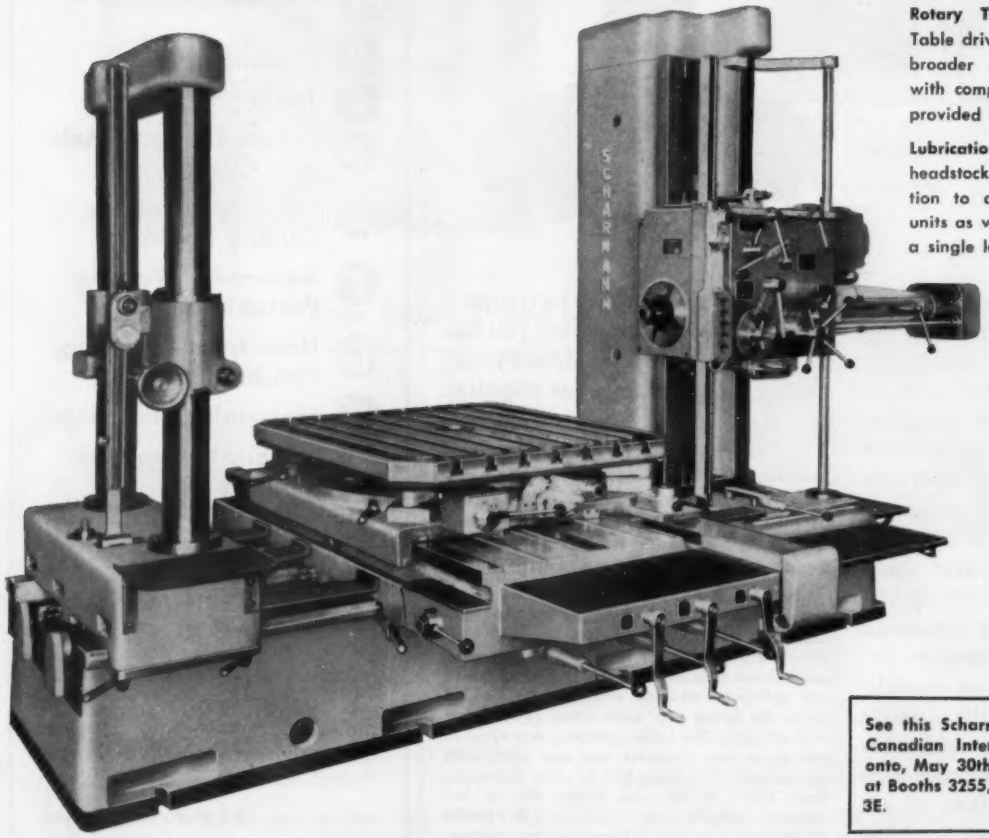
Full descriptive bulletins mailed promptly upon request or an appointment for an interview with a Scharmann Representative will be gladly arranged.

OTHER DOMINANT FEATURES INCLUDE:

Spindle Drive—The main drive motor is mounted on the head stock and boring spindle is rotated by means of two bronze keys set in splines in the spindle sleeve, thus eliminating gear pressure on the spindle. The feed pressure to the spindle is applied through back gears to the leadscrew which is concentric in the boring spindle. This is an exclusive feature of Scharmann machines and eliminates necessity for bevel gears. Axial pressure is taken up by thrust bearings. This construction eliminates back-lash, provides maximum motor power to spindle drive and assures consistently accurate production to close tolerances.

Rotary Table—Built in Power Rotary Table driven from feed box. Gives users broader machining possibilities than with comparable machines. Index stops provided for 90° positions.

Lubrication—Automatic lubrication to all headstock bearings. One shot lubrication to cross slide, table and saddle units as well as bed ways controlled by a single lever.



See this Scharmann Boring Machine at the Canadian International Trade Fair in Toronto, May 30th to June 10th, 1955. Stop in at Booths 3255, 3257, 3356, 3358 in Building 3E.

SCHARMANN Machine Corporation...

337 Boulevard of the Allies, Pittsburgh 22, Pa.

Table Types • Floor Types
Portable Types

HORIZONTAL BORING MACHINES

EVEN if the cost per piece is actually higher, if the gears you use in your product are precision-engineered by Perkins, the *heart* of your product — its power transmission system — will function more efficiently. This factor is especially valuable when automation enters the production picture. In that case, *lack of functional precision,* could easily result in speeding up the manufacture of faulty products — a truly horrendous possibility.

Figured on the basis of trouble-free performance alone, the ultimate cost of Perkins Gears is considerably lower than their initial cost-per-piece would indicate. Best of all, even the initial cost of Perkins custom-made Gears may be competitive. And that is something you can quickly and easily determine by asking us to quote on your requirements.

PERKINS MAKES:

to customers' specifications, in all materials, metallic and non-metallic: bevel gears, ratchets, sprockets, ground thread worms, spiral gears, helical gears, spur gears with shaved or ground teeth.

NOTE: The PERKINS PRECISION SPRING COILER is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want when you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire sizes .005 to .125. Diameter, from 3/32" to 12" and larger. Size of the compact coiler is only 7 1/2x16". A POWER MODEL is available. Information on request.

PERKINS MACHINE & GEAR CO.

101 Circuit Ave., WEST SPRINGFIELD, MASSACHUSETTS

HERE'S YOUR CONSTANT INDEX TO MORE PROFITABLE PRODUCTION

This is just a reminder there's an easy way in which to get information in a hurry for solving those knotty production problems you're faced with daily.

Listed below is a general subject index to the answers you need, as you'll find them in your 1955 PRODUCTION PLANBOOK issue of *American Machinist.*

- **A** Management, Personnel
- **B** Machining
- **C** Tooling
- **D** Pressworking, Molding, Casting
- **E** Inspection, Testing, Quality Control
- **F** Assembly, Welding, Portable Tools
- **G** Heat-Treat, Cleaning, Finishing
- **H** Materials, Components
- **I** Materials Handling, Services
- **J** Prize Ideas, Rebuilt Equipment

And that's not all. An integral part of these ten sections are hundreds of informative advertisements . . . a list of manufacturers offering free product literature . . . and an alphabetic listing of products and services advertised in the PLANBOOK.

Information like this can help you find sure roads to faster, lower-cost production.

American Machinist
McGraw-Hill Building
New York 36, N. Y.

Introducing the World Famous WEISSER HEILBRONN High Speed LATHES in the United States

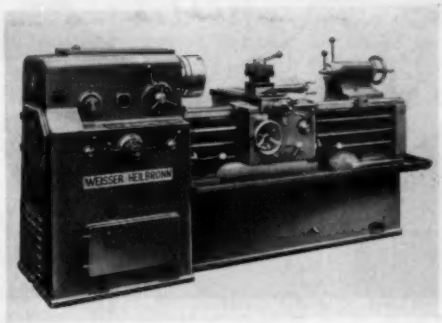
Represented By

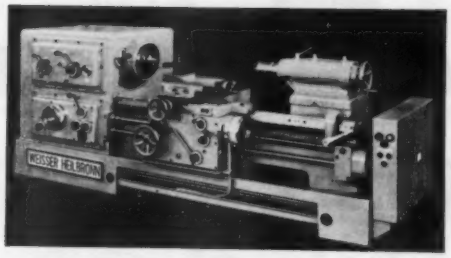
WEISSER MACHINERY CORPORATION

For the Sale and Service of these Noted Precision Lathes

New GOLIATH Model Lathe

Convenience of control and ease and smoothness of operation.



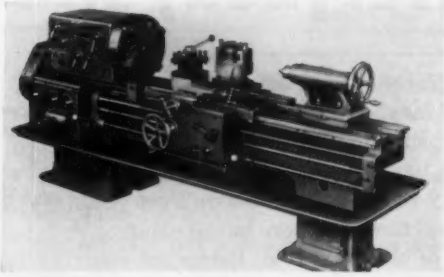


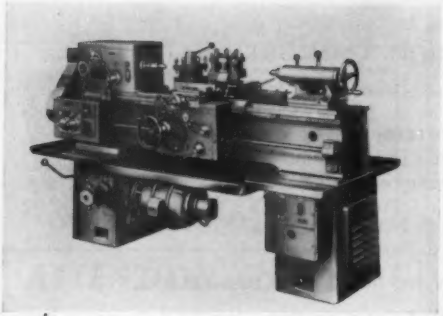
GIGANT Heavy Duty Lathe

Rigidity of construction insures against any operational stress in heavy duty work.

High Efficiency DLNE Lathe

Full protection against accidents through latest safety devices.





PZ 165 Production Lathe

Satisfies closest tolerance requirements. Especially suited for between centers work, such as rough-and-finish turning of shafts to gauge accuracy.

Parts and Service for

All Lathes available at short notice at our Linden warehouse.

'Phone: Linden 3-9110

Special Inducements to DEALERS

We wish to establish a wide active dealership contact throughout the United States. Choice territory is now open to responsible machinery sales organizations. *Write immediately for further details.*

WEISSER MACHINERY CORPORATION

WEISSER HEILBRONN

Engine Lathes . . . Tool Room Lathes . . . Production Lathes

1539 West Elizabeth Ave. **LINDEN, New Jersey**

IN CANADA: Transocean Machine Company, Inc., 1170 Drummond St., Montreal, P.Q. Telephone Linden 3-9110

If disaster strikes, everybody will want help at once

Imagine they just dropped an atom bomb.
(And maybe they will tomorrow. Who knows?)
You pick yourself up. You're unhurt.
Must have gone off some distance away.
Lucky that flying glass didn't get you.
Several fires out there in the plant.
Lots of casualties, too. Better get going.
Reach for the phone. It's dead. Well, you might have known.
Ambulances, fire engines, doctors, that's what you need.
And quick.
You've never needed help like you need it now.
But the same goes for everyone else in town.
Thank God Jones made all those people go to the first-aid classes.
Looks like they'll be the only help you'll get for hours.
Thank God they've got plenty of dressings, splints and stuff.
Remember when you got sore at Jones?
("All this stupid first-aid malarkey," you called it.)
Know better now, don't you?
Place looks like a tornado hit it.
Maybe that's what it was?
Whatever it was, better get busy.
There's plenty to do. Thank God you were ready.

Whatever the emergency is—you can be ready for it. That's just good business. Take these precautions TODAY.

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
- ☐ **Promote preparedness** in your community. Your local CD Director can show you how.

Check off these four simple points NOW—it's a matter of life or death.

NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITIES OFFERED

Manufacturers' Representatives — to represent large Mid-Western manufacturer of speed reducing transmissions and cut gears of all types, on a commission basis, for territory of Detroit, Michigan or Birmingham, Alabama—must be experienced in engineering and sales—all replies will be held strictly confidential. RW-6299, American Machinist.

Manufacturers' Agents wanted. Several territories available for well-known McCaskey Control systems: tool crib and gage control, production, maintenance and inventory controls, equipment, multicopy forms etc. Full details of potential sales, repeat business etc., on receipt of complete resume your experience, accounts and territory. McCaskey Industrial Div., Victor Adding Machine Co., 3900 North Rockwell St., Chicago 18, Ill.

SALES ASSOCIATE

California Representative for lucrative national tooling lines plans retirement and seeks right party party to gradually take over business, on long term payment basis. Must be a Salesman.

BO-5639, AMERICAN MACHINIST
1111 Wilshire Blvd., Los Angeles 17, Calif.

WANTED SMALL FACTORIES

To locate in center of population of U. S. Employ males. Write for details.

CLYDE KING, Industrial Dept.
Chamber of Commerce, Olney, Ill.

TUBE RECUTTER

Automatic paper tube cutting machine wanted.

ANCHOR PLASTICS COMPANY, INC.
36-36 36th St., Long Island City 6, N. Y.

CONTRACT WORK

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

10 to 12 ft. lengths
ALL METALS
Also Screw Machine Products to Order
EASTERN
Machine Screw Corp.
20-40 Barclay St.
New Haven, Conn.
Makers of H & G Die Heads

ATTENTION . . .
EMPLOYMENT ADVERTISERS

Effective with the July 4th issue, a new section will start in American Machinist. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisements will be billed at the transient rate of $16.65 per inch unless on contract. Contract rates furnished on request. Ads are subject to Agency Commission.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

UNDISPLAYED ——RATES—— DISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Position Wanted advertising rates are ½ the above rate payable in advance.
Box Numbers—counts as 1 line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.
The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

EMPLOYMENT ADVERTISING:—New Employment Opportunities Section for Displayed ads starting July 4 issue. For details see announcement ad in this section.

ESTIMATOR WANTED

Calculate Machining time. Write Operation Sheets. Plan tools, jigs and fixtures. Must be thoroughly experienced, precision machine shop methods.

ACCURATE MACHINE PRODUCTS CORP.
JOHNSON CITY, TENNESSEE

MACHINE SHOP SUPT.
START ABOUT $10,200

Mfr. of Engines—Machining Division—325 employees—plant employs 2300—further oppor. for good man.

RAY EDWARDS & ASSOCIATES
28 E Jackson—Webster 9-2905—Chgo 4, Ill

WANTED
SALES REPRESENTATIVES

Mfrs. of punch presses and sheet metal working machinery wants manufacturers' representatives. Must have following with machine tool dealers and have technical knowledge of punch presses. Commission basis. Send complete information, including area covered and lines handled to:

DIAMOND MACHINE TOOL CO.
PICO, CALIFORNIA

SAMSON
BUYS SELLS
STANDARD OR SPECIAL MACHINERY AND EQUIPMENT
FUNDS AVAILABLE
FOR PURCHASE OF SINGLE MACHINES OR COMPLETE PLANTS
SAMSON MACHINERY CO.
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14"x36" Landis type C, hydraulic (2), 1946
16"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16191
12" Model 22 Heald rotary surface, 1942
16A2 Blanchard rotary surface, serial 6046, 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942
72" No. 72 Hanchett rotary surface, 1946

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12"x30" Monarch model C, ser. CK16407, 1942
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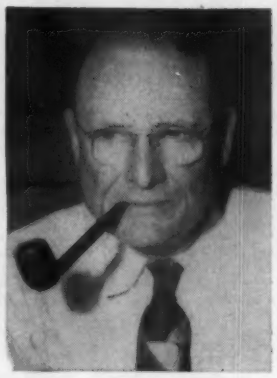

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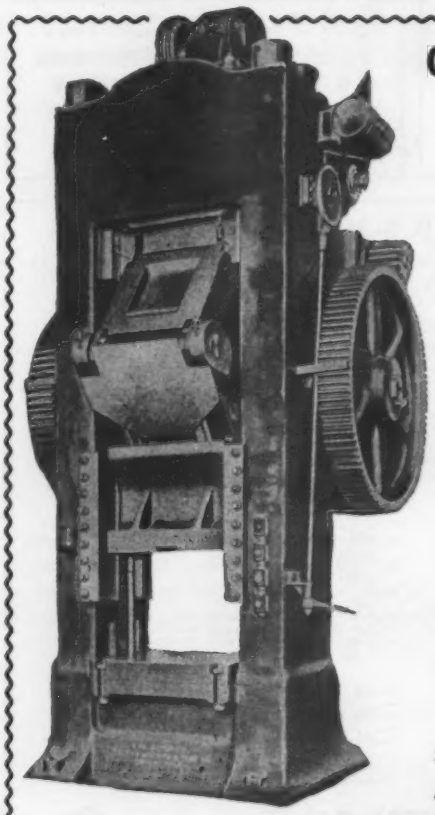

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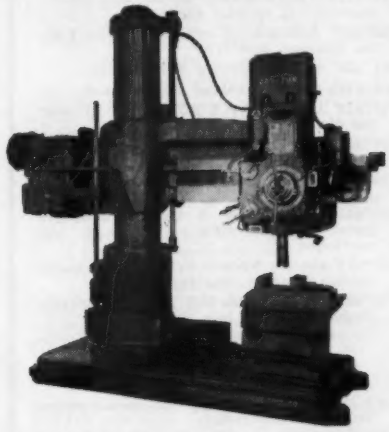

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LUCAS #42 Precision; late type
NILES 8" bar; floor type; motor drive

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NILES 100", 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

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OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Manufacturing

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BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
CLEVELAND "A" 5¾" single spindle; late type
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LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 4-spindle, M.D.; late
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NATCO B-3-B "Hole Steel" 12 adj. spindles; late
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FELLOWS No. 48 High Speed Gear Shaper; internal cap. 72" diameter; late type
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Red Liner; New 1954
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GLEASON No. 20 Spur Gear Tester; latest type
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 32" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.

BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Mod ER Plain, "Filmatic"; late
CINCINNATI #2 Centerless, Model EA Filmatic; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 16"x36" type "C" Universal, M.D., late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" Type "C" Plain; late type

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BRYANT #5 Internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #24—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #78 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947

LATHES, Turret

GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late

LATHES, Engine & Mfg.

AMERICAN 10"x102" centers, "Pacemaker"; late type
AMERICAN 36"x23' c.c., PRT; 2 cross slides; late type
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers; M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
MONARCH 16"x54" Centers, Motor Drive
MONARCH 16"x78" centers, Model CW, Timken, late
MONARCH 16"x78" c.c. Model CW; Timken; late type
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NILES 30"x108" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" c.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain

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NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
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WATERBURY FARREL #9, 125-ton cap., M.D.

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GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; motor drive; late type

MISCELLANEOUS

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AVEY No. 2, 2-spindle Drill Press; late type
BARNES No. 172 Honing; M.D., hydr.; late type
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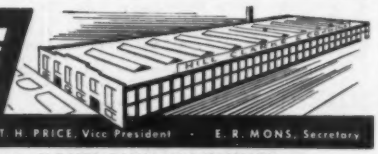

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No. 74 Heald Int. Centerless
No. 72-A Heald Univ. Int.
No. 72A5 Heald Int. (1942)
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No. 5A Bryant Hole & Face
No. 5B Bryant Internal
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No. 16-26 Bryant Internal
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No. 7A Jones & Lamson
No. 2A Warner & Swasey
3A Warner & Swasey Turret (1942)
No. 3AL Gisholt Cross Slide
No. 3H-10 Libby International
No. 3A Warner & Swasey Turret Lathe
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)

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No. 4 Cincinnati Dial Type Plain
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18" Dill Slotter
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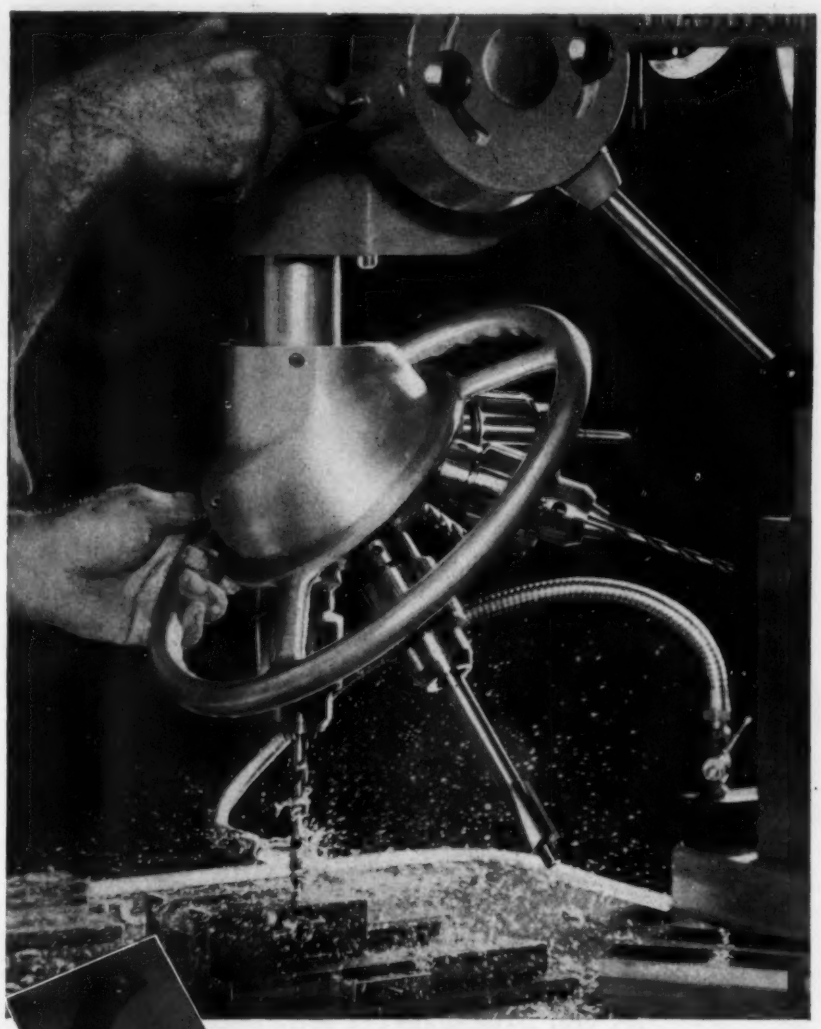

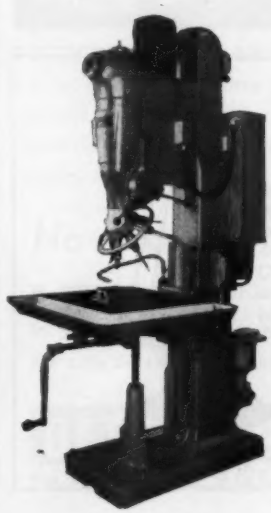

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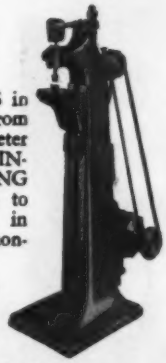

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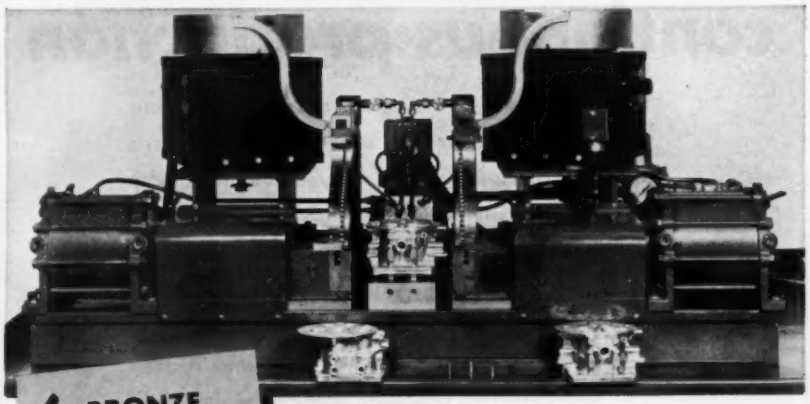

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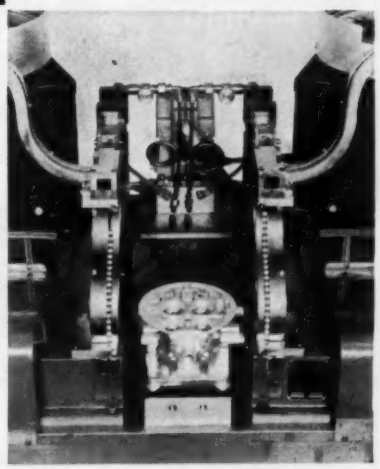

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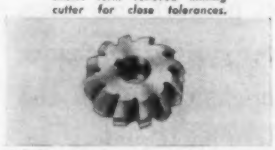

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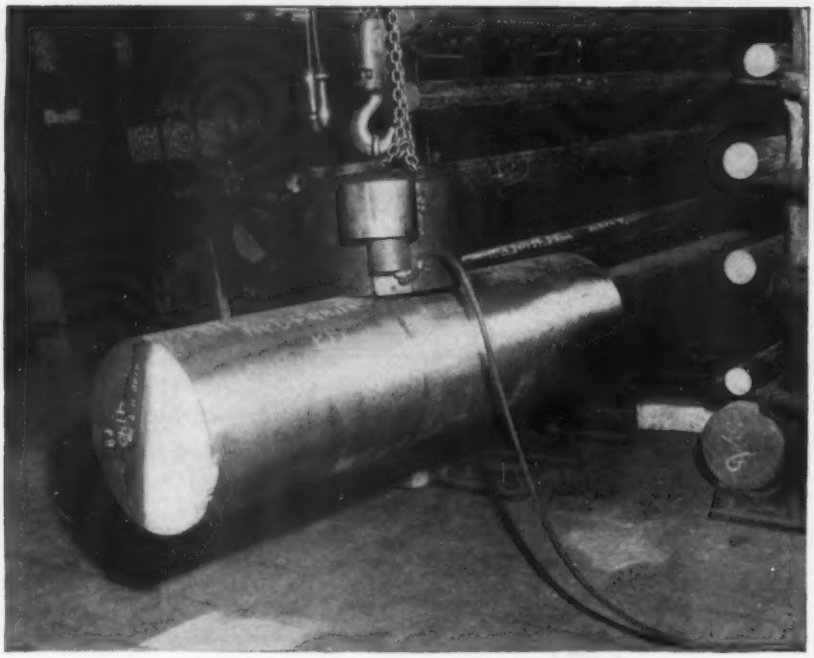

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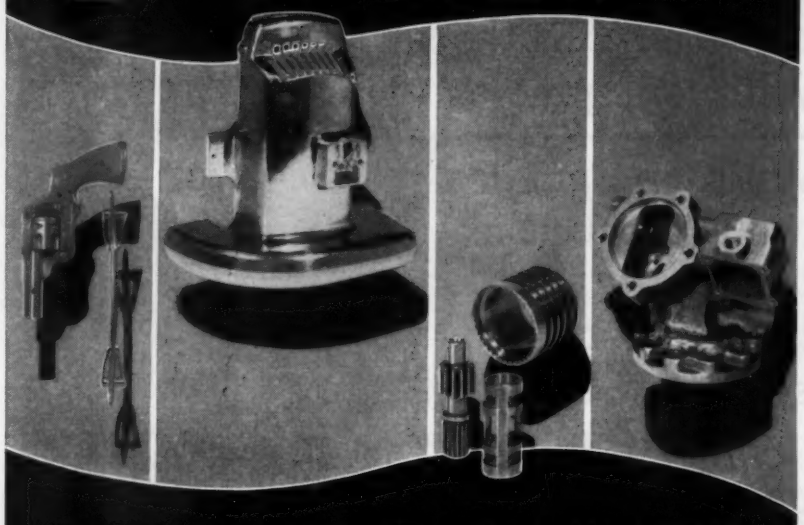

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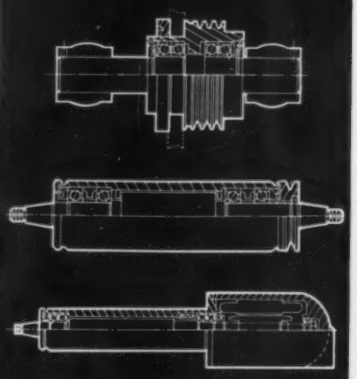

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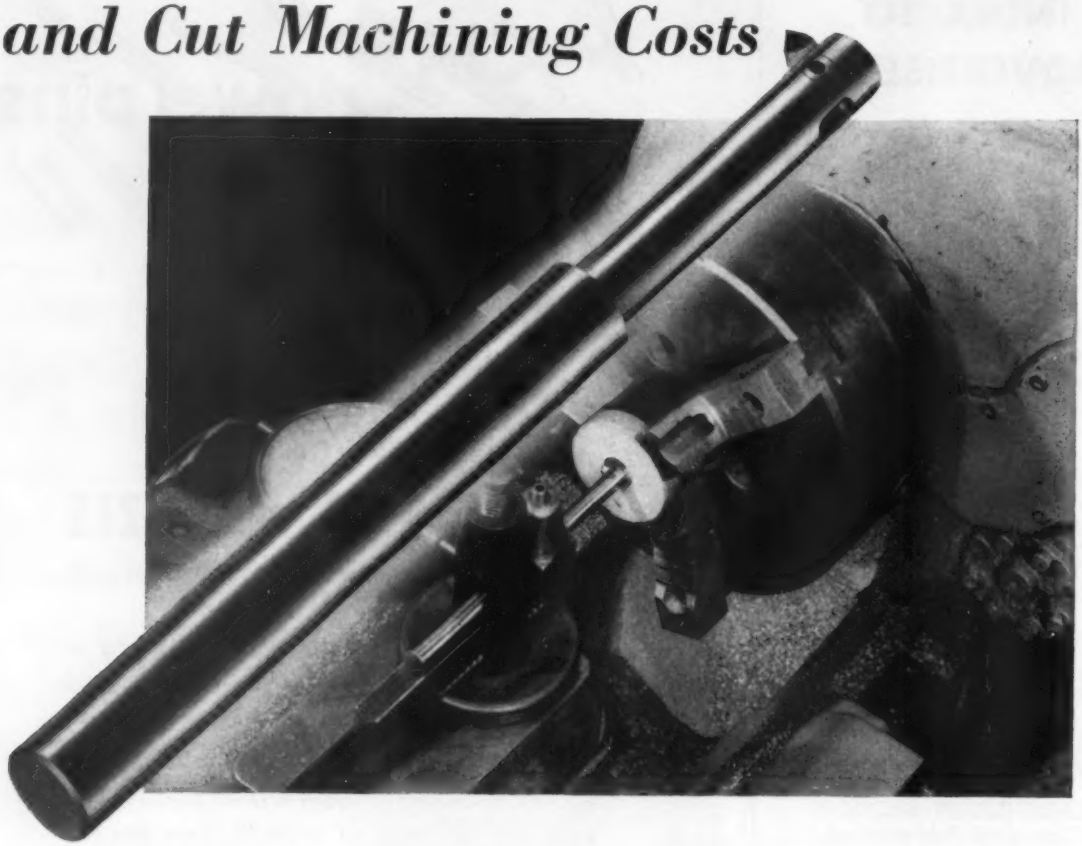

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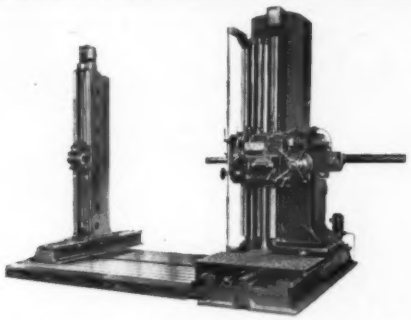
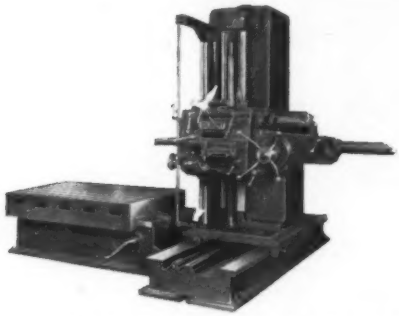
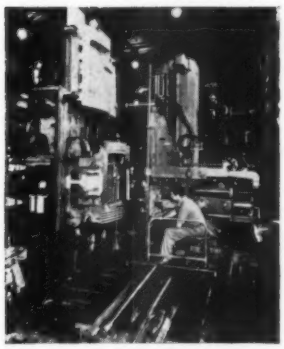


Floor type with bed plate and boring bar support. Used in shops where workpieces are large, weighing as much as 20 tons. Stationary or adjustable tables can be attached to the bed plate.



Floor type with large table, adjustable either by hand or power. The Gilbert machine can be rail mounted to increase operating range and flexibility.



Large Gilbert floor type horizontal boring mill equipped with a duplicating attachment for spindle. 3¾" spindle, 96" vertical travel of spindle head, 120" horizontal travel of column on runway.

Specification summary	floor type
Spindle diameter	*3½" or 3¾"*
Continuous feed to spindle	*30"*
Vertical travel of spindle head	*36"-96"*
Horizontal travel of column	*48"-"168"*
Drive motor, hp	*7½ or 10HP*

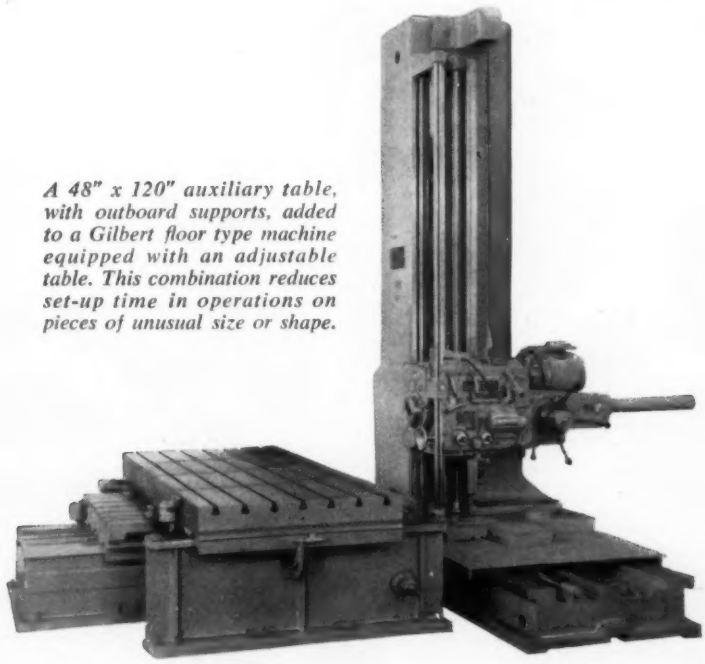
sell machine time for less per hour

You can sell your machine time for much less per hour if your machine is a Cincinnati Gilbert boring mill.

Take the floor type Gilbert, for example. Combine the basic machine with one of Gilbert's many workholding units, and you can do as many operations as you can do on equipment costing many times more. With the revolving-column Gilbert, you can even mill cavities with straight sides or reverse curves without resetting work. If you wish, the Gilbert mill can be adapted to workholding equipment or runways already in your shop.

Ask for a proposal; you'll see that it pays to replace with a Gilbert. New literature will be sent at your request.

A 48" x 120" auxiliary table, with outboard supports, added to a Gilbert floor type machine equipped with an adjustable table. This combination reduces set-up time in operations on pieces of unusual size or shape.



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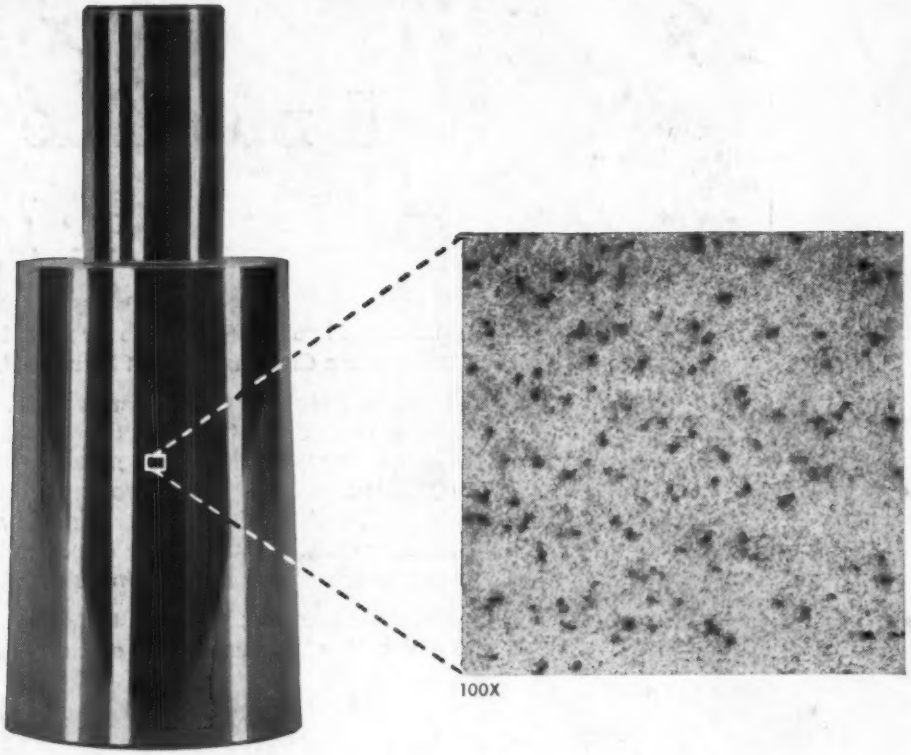

GRAPH-MO® steel is a *different kind* of gage steel. And the difference between Graph-Mo and ordinary gage steels is so real you can *see* it!

A piece of polished Graph-Mo steel has a "graphitic look"—tiny, scattered, parallel marks barely visible on the surface. These marks are the result of free graphite in the steel's structure. And this free graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other gage steels an average of 3 to 1. Reports from dozens of gage users who've switched to Graph-Mo prove it! (Details on request.)

The photomicrograph (above) shows the free graphite and diamond-hard carbides that give Graph-Mo its unusual wear resistance. They also minimize scuffing, pick up and galling, and resist abrasion.

Tests prove that Graph-Mo is the most stable gage steel ever made, too! After a 12-year period, a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original measurement.

And constant-pressure machinability tests show Graph-Mo machines 30% faster than other gage steels. (Machinability test data on request.)

You can always tell Graph-Mo by its "graphitic look". This built-in "trade-mark", the result of the free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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